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A Computer Code for Estimating Installed Performance of Aircraft Gas Turbine Engines

Vol. II - Users Manual

By Edward J. Kowalski and Robert A. Atkins Jr.

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Advanced Airplane Branch
Boeing Military Airplane Company
Seattle, Washington 98124

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FOREWORD

This report documents the work accomplished during NASA LeRC Contract No. NAS3-21238. It was the purpose of this contract to develop a supervisory computer program which would tie together routines (either presently existing or to be developed) which would access the installation of a propulsion system. The contract was divided into seven tasks:

- Task A - Data Base
- Task B - Supervisory Program
- Task C - Nacelle Weight and Drag
- Task D - Nozzle Boattail Drag
- Task E - Pitot Inlets
- Task F - Two-Dimensional Inlets
- Task G - Axisymmetric Inlets

In TASK A, standardized formats for:

- Inlet performance and drag
- Nozzle internal performance and aftbody drag

were compiled for the data base described in this contract. In TASK B, a supervisory computer program was developed which evaluates the installation penalties associated with the inlets and nozzles of TASK A. The NASA NAVY Engine Program (NNEP), modified through the contract NAS3-21205 to predict bare engine weight, was used as this computer program's driver routine. The supervisory computer program also has the capability to determine the changes in inlet performance due to perturbations in engine cycle characteristics and/or inlet design parameters. In TASK C, computer procedures were developed for estimating nacelle weight and drag. In TASK D, a computer procedure was developed for estimating boattail drag for the nozzle data base of TASK A. In TASKS E, F, and G, a theoretically-based computer procedure was supplied to estimate conceptual design, performance and weight for pitot inlets, mixed and external compression axisymmetric and two-dimensional inlets.

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Mr. L. J. Winslow was Program Manager for the Boeing Company. E. J. Kowalski was principal investigator. The following individuals contributed to the work accomplished during this contract: G. W. Klees, general consulting; R. A. Atkins, Jr., computer programming; S. G. Kyle and R. J. Pera, inlet performance; R. W. Rankin, inlet and nacelle weight; A. Hagen, A. Killinger, J. Welti, document preparation.

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SYMBOLS AND NOMENCLATURE

A	Area, ft^2 (m^2)
A_C	Inlet capture area, $ft^2(m^2)$
ALT	Altitude, ft(m)
A_o	$A_{o_I}-A_{o_{BLD}}$
$A_{o_{BLD}}$	Freestream tube area of bleed air entering the inlet, $ft^2(m^2)$
$A_{o_{BYP}}$	Free stream tube area of bypass air entering the inlet, $ft^2(m^2)$
A_{o_E}	Free stream tube area of engine demanded air entering the inlet, $ft^2(m^2)$
A_{o_I}	Free stream tube of air entering inlet, $ft^2(m^2)$
$A_{o_{SPL}}$	Free stream tube of air entering inlet, $ft^2(m^2)$
AR	Aspect ratio

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SYMBOLS AND NOMENCLATURE (Continued)

A_w	Wetted area, $ft^2(m^2)$
A_{10}	Maximum cross sectional area, $ft^2(m^2)$
C_D	Drag coefficient
C_{F_G}	Nozzle gross thrust coefficient
C_P	Pressure coefficient
C_0	Angularity loss coefficient
$C_{D_{PAP}}$	Incremental drag coefficient due to tail fore-and-aft location
C_{D_R}	Incremental drag coefficient due to radial tail orientation
D	Drag, lb_f(Nt)
	Diameter, ft(m)
g_0	Acceleration of gravity, 32.174 ft/sec^2 (9.806 m/sec^2)

SYMBOLS AND NOMENCLATURE (continued)

h	Height, ft(m)
IMS_T	Integral mean slope parameter, truncated
	$IMS_T = -\frac{1}{(1 - A_9/A_{10})} \int_{A_9/A_{10}}^{1.0} \frac{d(A/A_{10})}{d(L/D_{eq})} \, d(A/A_{10})$
L	Length, ft(m)
M	Mach number
M_s	Started Mach number
P	Pressure, $lb_f/ft^2 (Nt/m^2)$
PS	Power setting
q	Dynamic pressure, $lb_f/ft^2 (Nt/m^2)$
r/D	Ratio of inlet lip radius to inlet highlite diameter
R_e	Reynolds number
T	Temperature, $^oR (^oK)$

SYMBOLS AND NOMENCLATURE (continued)

V	Velocity, ft/sec(m/sec)
W	Air flow, lb_m/sec(kg/sec)
	Weight, lb_m(kg)
	Width, ft(m)
W_{COR}	Corrected airflow - $\frac{W\sqrt{\theta}}{\delta}$, lb_m/sec(kg/sec)
α	Nozzle convergence angle
δ	Pressure ratio - P/2116.2
ϵ	Subsonic duct loss coefficient
γ	Ratio of specific heats
θ	Temperature ratio - T/518.688
θ_{DIV}	Divergence half angle
θ_N	Wedge half angle (2D nozzle)

Θ_P	Plug half angle (round nozzle)
Θ_R	Radial tail orientation

<u>Subscripts</u>

AB	Aftbody
AC	Capture area
ADD	Additive
AMB	Ambient
BASE, B	Base flow region
BD	Bypass door
BLC	Bleed
BYP	Bypass
CD	Convergent-Divergent

SYMBOLS AND NOMENCLATURE (continued)

CON	Convergent
D	Design
E	Exit
EFF	Effective
ENG	Engine
f	Flap
GEO	Geometric
HI	Hilite
lip	Inlet lip
MAX	Maximum
MIN	Minimum
MOM	Momentum
PRI	Primary

SYMBOLS AND NOMENCLATURE (continued)

REF	Reference
SEC	Secondary
SPILL	Spill
T	Throat
	Total
0	Local conditions for inlet, ambient conditions for nozzle
1	Inlet entrance
2	Compressor face
8	Nozzle throat
9	Nozzle exit

1.0 INTRODUCTION

Under NASA LeRC Contract NAS3-21238, a computer program has been written which ties together existing methods and methods developed under this contract which calculate:

- o aircraft gas turbine engine performance
- o aircraft gas turbine engine weight and dimensions
- o inlet internal performance, drag and weight
- o nozzle internal performance and drag
- o nacelle drag and weight

The purpose of this Manual is to provide a user oriented description of the program input requirements, program ouput, deck setup, and operating instructions. It also provides examples of tabular input tables that can be used as a test case to exercise the major calculation paths of the installation program. An example of an output from a typical calculation session is also included.

The computer code has been written in USASI FORTRAN VI to be compiled with the FORTRAN G compiler on the IBM 360/67 Full Duplex System located at the NASA LeRC.

Figure 1 shows the data flow for the installation program.

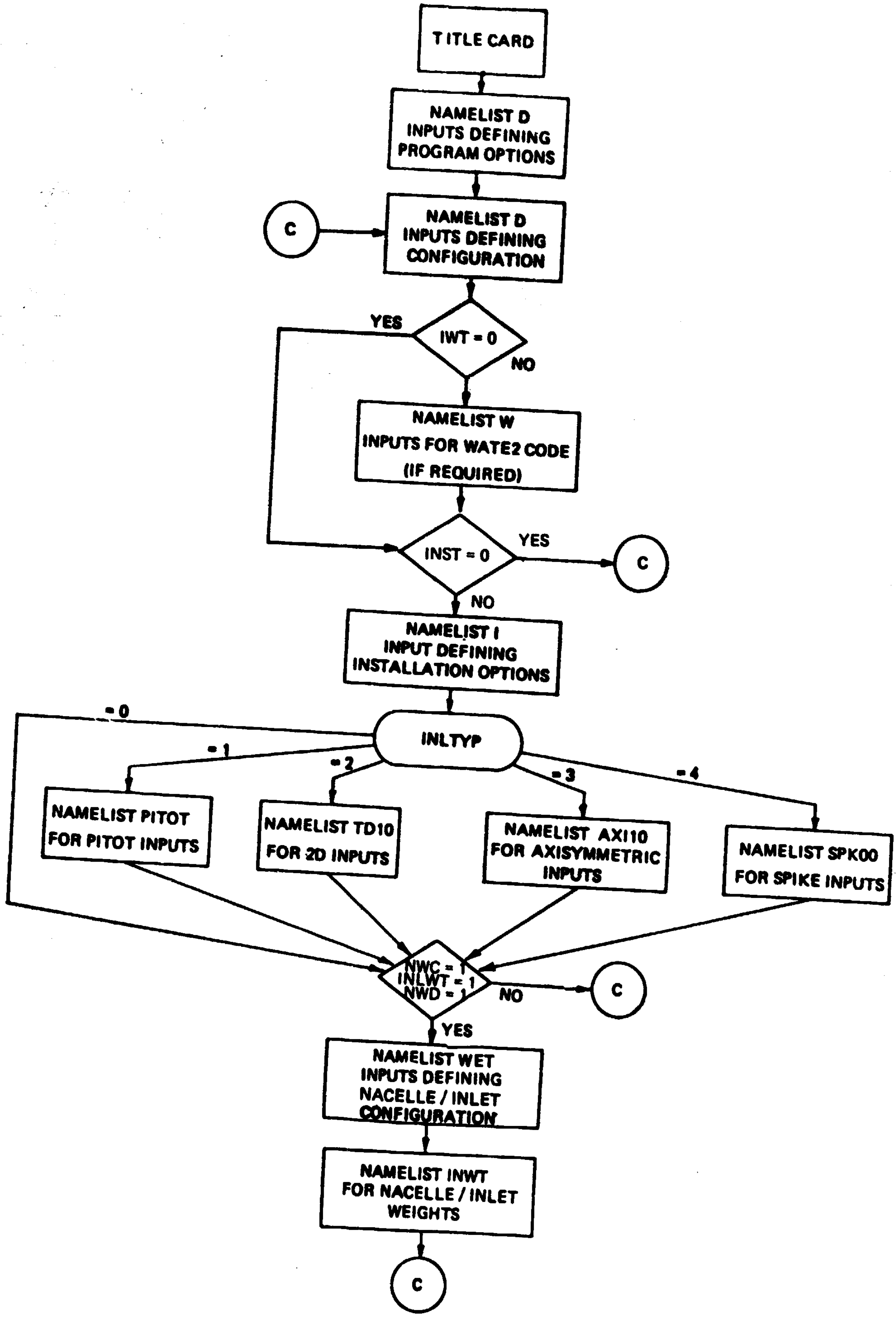


Figure 1 Macro Flow of Data Paths

2.0 PROGRAM SPECIFICATIONS

The computer code is essentially comprised of separate programs which are executable within the NNEP structure. These separate programs (or subprograms) are the following:

a. The NNEP code
b. The WATE-2 code
c. The inlet and nozzle/aftbody installation code
d. The automated procedures for the design and analysis of 2-D and axisymmetric inlets
e. The automated procedure for the design and analysis of pitot inlets
f. Inlet and nacelle weight code
g. Nacelle drag code

All of the case inputs to the code are in NAMELIST input format for ease of user input. There are two data bases which may be used to select an appropriate engine/inlet/nozzle/aftbody configuration. The engine data base is read from an externally attached dataset into local core storage when the code is being executed. The inlet and nozzle/aftbody data base, on the other hand, is an externally attached data set and is read sequentialy to find the appropriate inlet nozzle and aftbody desired for a particular problem.

The program occupies approximately 1800K bytes storage on the IBM 370 MVS computer system. The source code is compiled using the FTG1C compiler. This compiler was selected due to the difficulty of compiling the TD42 2D analysis program.

3.0 PROGRAM USAGE

The computer code has been written to utilize NAMELIST input except for the title card, label cards and all performance maps. The following sections show the JCL, data input logic, and the input required.

The computer code accepts all case input from Unit 9 and transfers single contiguous groups of NAMELIST inputs to Unit 8 for re-reading by the input routines. The output from the program is on Unit 10. Units 12 and 51 are used for the NNEP engine and the installation map data bases, respectively.

3.1 DECK SETUP

The inputs required to run the program along with the necessary JCL are included in the next two sections. A job setup consists of the necessary JCL followed by the data bases to be run with the data residing on FT09F001.

3.1.1 JCL

The IBM 370 JCL required to run the program is shown in Figure 2. In this typical example, the program load module is named INT2 and is a member of the partitioned data set XBP001.LOAD.

Aside from scratch files and dummy files, the required DD names to run the code for Estimating the Installed Engine Performance are as follows:

FT08F001	a temporary file which has a single NAMELIST grouping on it an any one time
FT09F001	all the NAMELIST inputs are included on this file. NOTE: the logical record length for this file is 80.
FT07F001	Dummy file for intermediate output
FT10F001	this file contains the listed output from a program execution

FT12F001	this file contains the NNEP engine component maps
FT18F001	this scratch file will contain a CFG table in the format required by the NNEP engine data base
FT51F001	this file is the inlet, aftbody, CFG and Delta CD map configurations

The user should use the JCL shown in Figure 2 as the basis for program execution. Aside from data set name differences, the logical record lengths and block sizes should remain the same.

3.1.2 DATA STRUCTURE

This section includes a macro flow chart (Figure 1) of the data flow to run the code. The major decision paths as well as the NAMELIST data blocks required at each path are shown. All data described is on Unit 9.

3.2 NAMELIST INPUTS

The first card read from the input file (Unit 9) is a title (or label) card and can be 60 characters in length.

All further input is entered via NAMELIST statements. Data is read in on Unit 9 and transferred to Unit 8 until a &END card is encountered. The program then reads from Unit 8 using NAMELIST read statements.

```
// EXEC PGM=INT2,REGION=900K
//STEPLIB DD DSN=XBP001.LOAD, DISP=SHR
//FT01F001 DD DCB=(RECFM=VS,BLKSIZE=10000),
//    SPACE=(20000,(2,1)),UNIT=SYSDA,DISP=(NEW,DELETE)
//FT02F001 DD DCB=(RECFM=VS,BLKSIZE=10000),
//    SPACE=(20000,(2,1)),UNIT=SYSDA,DISP=(NEW,DELETE)
//FT03F001 DD DCB=(RECFM=VS,BLKSIZE=10000),
//    SPACE=(20000,(2,1)),UNIT=SYSDA,DISP=(NEW,DELETE)
//FT04F001 DD DUMMY
//FT05F001 DD DUMMY
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=A,DCB=(LRECL=133,BLKSIZE=1729,RECFM=FB)
//FT08F001 DD DCB=(LRECL=80,BLKSIZE=1200,RECFM=FB),
//    SPACE=(2400,(2,2)),UNIT=SYSDA,DISP=(NEW,DELETE)
//FT09F001 DD DSN=XBP001.N10.DATA, DISP=OLD,
//    DCB=(LRECL=80,BLKSIZE=1200,RECFM=FB)
//FT10F001 DD SYSOUT=A,DCB=(LRECL=133,BLKSIZE=1729,RECFM=FBA)
//FT11F001 DD DCB=(LRECL=7300,RECFM=VBS,BLKSIZE=7300),
//    SPACE=(7300,(2,1)),UNIT=SYSDA,DISP=(NEW,DELETE)
//FT12F001 DD DSN=XBP001.FT12.MAPDAT,DISP=MOD
//FT13F001 DD DCB=(LRECL=133,BLKSIZE=1596,RECFM=FBA),
//    SPACE=(1596,(50,50),UNIT=SYSDA,DISP=(NEW,DELETE)
//FT14F001 DD DUMMY
//FT15F001 DD DCB=(LRECL=133,BLKSIZE=1596,RECFM=FBA),
//    SPACE=(1596,(50,50)),UNIT=SYSDA,DISP=(NEW,DELETE)
//FT18F001 DD UNIT=SYSDA,SPACE=(CYL,(2,2)),
//    DCB=(LRECL=80,BLKSIZE=80,RECFM=FB),
//    DISP=(NEW,DELETE)
//FT51F001 DD DSN=XBP001.MAPX1.DATA,DISP=OLD,
//    DCB=(LRECL=80,BLKSIZE=80,RECFM=FB)
```

Figure 2 Typical JCL Example

3.2.1 NNEP INPUTS (NAMELIST D)

This section provides a user manual for execution of the NNEP engine cycle analysis code.

VARIABLE	DEFINITION
NCOMP	the total number of components including controls that will be configured through all the modes. Note that it is not necessary that any one mode use all of the components. Note also that if a component is used in more than one mode, its number must not change from mode to mode and that the same number may not be used for more than one component.
NOSTAT	the number of stations configured through all of the modes. It is NOT necessary that these remain the same through all modes, but it is advisable to keep as many the same as possible for clarity.
NMODES	the total number of modes to be configured. (Default value is 1)
MODESN	designates the design mode. (Default is 1)
IWAY	input IWAY=1 if design point (Default is 1 for first point, and 0 for all other points)
TABLES	TRUE if maps are used, FALSE if not. (Default:T)
ITPRT	if = 0 do not print tables (maps) on output if = 1 print tables on output (Default is 0)
NCODE	if = 1 normal running if = 2 debug running (output after each pass) if = -1 or -2, same as +1 & +2 BUT FULL PASS thru cycle is made on each pass if = 3 indicates that a sequence of design points follows (shortens output) and obviates need to supply a &D IWAY=1 &END for each case.
LABEL	a control for printing a label at the top of a page to identify the point being run. Set LABEL=F until off-design points are run. Then if labels are desired, set LABEL=T and follow the NAMELIST data with the label card (similar to the title card). See also PINPUT. (Default is F)

VARIABLE	DEFINITION
PUNT	set PUNT=T to use last good point as set of first guesses for next point. It is advisable to always have PUNT=T. (Default:T)
LONG	control for printing of history of the convergence process. It is advisable to have LONG=T for new problems. (Default:T)
PINPUT	a control for causing the NAMELIST input for a case to be printed on the output sheets prior to the results for that case. PINPUT causes a write on Unit 8 which must therefore be DDEF'd. If PINPUT is FALSE, no NAMELIST output will occur. (Default:T)
NCASE	set = to 1 for new design case with NEW KONFIG (Default initially =1, then set to 0)
DRAW	set = T for figure to be drawn (Default:F)
AMAC	set = T to punch data cards for AMAC (Default:F)

Approximate NAMELIST installation effects are included in the orginal NNEP program. The following inputs must appear on the first set of data cards if approximate installation effects are desired. These NAMELIST inputs are defaulted so that the approximate installation calculations must be requested. These simplified installation effects are independent of the INSTAL computer code.

VARIABLE	DEFINITION
BOAT	set BOAT=T for boattail drag calculations
SPILL	set SPILL=T for spillage & lip drag for inlet
INLTDS	set=T at operating condition for sizing the inlet (i.e. may or may not be set T of first set of cards)
SPLDES	amount of design spillage when INLTDS=T (fraction)
AMINDS	FLIGHT Mach number at point where INLTDS is TRUE

VARIABLE	DEFINITION
BLMAX	no longer an input. The inlet bleed is now set equal to .016 * am**1.5
BPMAX	maximum inlet bypass flow fraction (usually at a Mach number of 1.6) not currently used.

The following NAMELIST D inputs are required to access the INSTAL and WATE-2 codes:

VARIABLE		DEFINITION
INST	=0	Do not turn on installation calculation
	=1	Turn on installation calculation
IFLGRF	=0	Run NNEP with the &D inputed inlet recovery
	=1	Run NNEP with the inlet recovery determined by the installation routine
AJMAX AJMIN		Maximum, minimum, nozzle throat area to be experienced in the Mach number/altitude flight regime (XNOZFG=0, for a turbojet, mixed flow turbofan, or coplanor nozzle turbofan only).
IWT	=0	Do not do weight calculation
	=1	Turn on the thermodynamic parapeter maximization of the WATE code. Do not do weight calculation
	=2	Do weight calculation using maximum thermodynamic parameters
	=3	Do weight calculation but do not write maximum conditions for the components
	=4	Do weight calculation with airflow scaling

If TABLES=T, the code will now go to Unit 12 and read in the NNEP cycle component performance maps. At this point we have told the code how many modes are to be read in. We will now read in the configuration data and specifications for these modes. This is accomplished in NNEP through a DO LOOP. After NMODES of data have been read in, the program will run MODESN as the design point.

Thus we now input &D MODE=1, and read in the data for mode 1. We end this read with &END, then input &D MODE=2, etc.

Each of the component types has a different set of input variables. The form, however, is invariate except for controls. Each of these types will be discussed in sections 3.2.1.1 through 3.2.1.14.

For all types except controls and optimization variables, data is read in the following form.

```
KONFIG(1,N)='NAME',JM1,JM2,JP1,JP2,
SPEC(1,N) or SPECS(1,N)=V1,V2,.....V15 (both names work)
```

where N is the component number

- JM1 is the primary upstream airflow station number for flow components or the first component hooked onto a shaft.
- JM2 is the secondary upstream station number, or the second component hooked onto a shaft.
- JP1 is the primary downstream station number, or the third component hooked onto a shaft
- JP2 is the secondary downstream station number, or fourth component hooked onto a shaft.
- NAME identifies the type of component and is entered in single quotes as follows:

  'INLT' = inlet
  'DUCT' = duct or burner
  'COMP' = compressor
  'TURB' = turbine
  'HTEX' = heat exchanger
  'SPLT' = splitter
  'MIXR' = mixer
  'NOZZ' = nozzle
  'WINJ' = water injector
  'LOAD' = load
  'SHFT' = shaft
  'CNTL' = control
  'OPTV' = optimization variable
  'LIMV' = limit variable

SPECS are now used to fill an array DATINP inside NNEP. Some DATINP are not required as inputs or have their values changed internally.

By setting the variable ENDIT=1 any place in an input dataset, execution will terminate at the PREVIOUS case.

3.2.1.1 'INLT' - JTYPE=1

VARIABLE	DEFINITION
SPEC(1)	= inlet weight flow-lb/sec
SPEC(2)	= Tos - free stream temp -R
SPEC(3)	= Pos - free stream P-lb/in2
SPEC(4)	= inlet drag Table ref. number - if blank computed
SPEC(5)	= Mach number at inlet
SPEC(6)	= inlet recovery, constant or Table ref. number If = 0, Mil Spec is used
SPEC(7)	= if SPEC(6)= Ref #, 7=max permitted flow in table
SPEC(8)	= if SPEC(6)= Ref #, 8=scale factor on flow
SPEC(9)	= Altitude-feet, only used if Tos and Pos=0 (see a) (geometric altitude)
SPEC(10)	= f/a at inlet, usually =0
SPEC(11)	= if non zero, SPEC(9) is geopotential altitude
SPEC(12)	= del T to be added to Tos (usually 0) (see a)
SPEC(13) through SPEC(15)	= BLANK

(a) If Del T is to be added to Tos, Altitude (SPEC(9)) cannot be zero, thus for SLS, set SPEC(9) = .00001

NOTE: MACH, ALTP, and ETAR can replace SPECS 5, 9, and 6

3.2.1.2 'DUCT' - JTYPE=2

Component type 'DUCT' is used for ducts, burners, and afterburners

VARIABLE	DEFINITION
SPEC(1)	= del P/P pressure drop or Table ref number
SPEC(2)	= optional, design duct Mach number. see (a)
SPEC(3)	= BLANK
SPEC(4)	= burner outlet temp -R if DUCT-BLANK
SPEC(5)	= burner efficiency or Table reference number if duct blank
SPEC(6)	= fuel heating value or Table ref. number - usually 18,300 if DUCT-BLANK
SPEC(7)	= cross sectional area of duct or burner (see a)
SPEC(8)	= ratio of inlet entrance bleed flow/total bleed available -DUCT only
SPEC(9)	= exit bleed/total flow
SPEC(10)	= fract. air not heated
SPEC(11) through SPEC(15)	= BLANK

(a) If SPEC(2) is input, then cross sectional area will be calculated at the design point. This area is then used to calculate momentum pressure drop.

3.2.1.3 'COMP' - JTYPE=4

VARIABLE	DEFINITION
SPEC(1)	= R value used to read Tables
SPEC(2)	= comp. bleed flow/total flow
SPEC(3)	= scale factor on $N/\sqrt{\theta} \neq 0$ (usually=1) $N/\sqrt{\theta}$ from map* scale f
SPEC(4)	= $W\sqrt{\theta}/\delta$ or Table ref. no. $\neq 0$
SPEC(5)	= Scale f on $W\sqrt{\theta}/\delta \neq 0$ (usually = 1) $W\sqrt{\theta}/\delta$ actual scale factor = Wcomp/Wmap
SPEC(6)	= ηcomp. adia. eff or Tab. #
SPEC(7)	= ηcomp. adia. eff at design scale f on η for maps
SPEC(8)	= comp PR or table ref. no.
SPEC(9)	= scale f on pressure ratio if SPEC(13) is input, *9 is calculated scale f
SPEC(10)	= 3rd dim. arg value on map
SPEC(11)	= fractional bleed horsepower loss due to interstage bleed = 0 means all bleed after full compression
SPEC(12)	= desired adia. eff. at des.pt.
SPEC(13)	= *desired PR at R and $N/\sqrt{\theta}$
SPEC(14)	= $N/\sqrt{\theta}$ for design pt. on maps
SPEC(15)	= BLANK

* overrides SPEC(9) if nonzero. If Tables are not used leave SPEC(9)=0.

3.2.1.4 'TURB' - JTYPE=5

VARIABLE	DEFINITION
SPEC(1)	= pressure ratio at design point on maps
SPEC(2)	= total bleed into turbine/total bleed available
SPEC(3)	= scale f on $N/\sqrt{\theta}$ (usu. =1) calculated scale f to match speeds at des.pt.
SPEC(4)	= $W\sqrt{T}/P$ or Table ref. no.
SPEC(5)	= scale f on $W\sqrt{T}/P$ (usu. =1) calculated scale f to match airflow at des.pt.
SPEC(6)	= turb adia. eff or Tab. no.
SPEC(7)	= design turb. adia. eff. scale f to get design eff at design point on maps
SPEC(8)	= scale f on PR (usually=1) scale f calculated to get desired PR on map
SPEC(9)	= turb. bleed flow at ent./total bleed flow
SPEC(10)	= 3rd dim. arg value on map
SPEC(11)	= desired η at design pt.
SPEC(12)	= $N/\sqrt{\theta}$ at design pt. on map
SPEC(13)	= turbine horsepower split (usually=1)
SPEC(14)	= **factor for cooling type
SPEC(15)	= **number of turbine stages

**COOLING CALCULATIONS

In order to calculate bleed requirements, the following procedures are to be followed:

CALBLD is set TRUE where bleed requirement is to be determined.

A control must be set to vary SPEC(2) of the compressor where bleed is being removed to drive 'PERF' 15 to zero.

Your other controls may or may not be turned on - make sure you set them to operate the way you want them to! For example, do you want BPR to be changing at the design point?

SPEC(14) is set to indicate type of cooling:
SPEC(14) = 1.000 = Full coverage film cooling (Default value)
= 0.885 = Transpiration cooling
= 1.173 = Convection + film cooling
= 1.886 = Convection cooling

SPEC(15) = number of turbine stages and is only used in sizing bleed requirements. (Default is 1 stage)

ELIFE = desired engine life (Default 10000 hrs.)
YEAR = year of first service (Default 1985)

For all other cases after sizing the bleed, you MUST set SPEC(9) of the bleed control to ZERO and CALBLD=.FALSE.

3.2.1.5 'HTEX' - JTYPE=6

VARIABLE	DEFINITION
SPEC(1)	= del P/P or Tab. ref # Main
SPEC(2)	= del P/P or Table # Sec'd
SPEC(3)	= del T rise (guess value)
SPEC(4)	= effectiveness or Tab ref #
SPEC(5)	= scale f of effectiveness
SPEC(6) through SPEC(15)	= BLANK

3.2.1.6 'SPLT' - JTYPE=7

VARIABLE	DEFINITON
SPEC(1)	= bypass ratio (W bypass/W main)
SPEC(2)	= del P/P main stream
SPEC(3)	= del P/P 2nd. stream
ALL REST BLANK	

WARNING: The program expects each splitter to result in an extra nozzle or a mixer. If such is not the case, use a DUCT with: SPEC(1,)=8*0, BPR, where BPR is the desired bypass flow/total flow.

3.2.1.7 __'MIXR'-JTYPE=8__

VARIABLE	DEFINITION
SPEC(1)	= inlet area of main flow not needed if SPEC(3) is specified inlet area of main flow
SPEC(2)	= inlet area of secondary not needed if SPEC(3) is specified
SPEC(3)	= inlet area of secondary total to static pressure ratio at main flow inlet if > 1, if < 1 = Mach # (at design point) total to static pressure ratio (calculated if both SPEC(1) & SPEC(7) given
SPEC(4)	= velocity coefficient on mixed flow velocity 1=ideal,<1=less than id.
SPEC(5)	= if=1 total inlet area is held fixed as 2nd area varies. (see Note). If=0 runs as before.
SPEC(6) through SPEC(15)	= BLANK

NOTE: To simulate a VABI set SPEC(5)=1. Then as you change the secondary inlet area either through a control or OPTV, the primary area will adjust to maintain fixed total. The primary area may NOT be varied - it will be over-ridden.

3.2.1.8 __'NOZZ' - JTYPE=9__

VARIABLE	DEFINITION
SPEC(1)	= flow area (in2), exit for conv., throat for C-D nozz calc. flow area at des.pt.
SPEC(2)	= flow coeff. or Tab. ref. #
SPEC(3)	= BLANK
SPEC(4)	= nozz exit static pressure lb/in2 (if 0 see SPEC(9)) nozz exit static pressure or component no. (see 9)
SPEC(5)	= Cv,vel. coeff or Tab #
SPEC(6)	= switch,=0=conv,=1=C-D
SPEC(7)	= area switch,=0 fix area to input value, =1 vary area to mach flow required (see a)
SPEC(8)	= BLANK
SPEC(9)	= if SPEC(4)=0, set SPEC(9) to component # of inlet
SPEC(10) through SPEC(15)	= BLANK

(a) When running duct or afterburning cases, SPEC(7) is usually set = to 1 after a dry case has been run. Be sure to reset to 0 before a new dry case is attempted.

3.2.1.9 'WINJ' - JTYPE=3

A reasonable approximation to water injector results is now available. Cp, R, and gamma are changed as if the water was fuel. No map changes are built in.

VARIABLE	DEFINITION
SPEC(1)	= water/airflow ratio
SPEC(2)	= fraction vaporized
SPEC(3)	= pressure drop
SPEC(4)	= saturation switch, 0=use SPEC(1),1=saturate
SPEC(5) through SPEC(15)	= BLANK

NOTE: To turn ON the water injector, SPEC(1) MUST be non-zero. The input value of SPEC(1) will be used unless SPEC(4) is equal to 1 in which case SPEC(1) will be over-ridden by the saturation value.

To turn OFF the water injector, set SPEC(1) to ZERO. Even though SPEC(4) may be equal to 1 (saturation) NO water will be injected.

3.2.1.10 'SHFT' - JTYPE=11

VARIABLE	DEFINITION	
SPEC(1)	= actual shaft rpm	
SPEC(2)	= gear ratio JM1 component	comp. rpm/shaft rpm
SPEC(3)	= gear ratio JM2 component	comp. rpm/shaft rpm
SPEC(4)	= gear ratio JP1 component	comp. rpm/shaft rpm
SPEC(5)	= gear ratio JP2 component	comp. rpm/shaft rpm
SPEC(6)	= mech. eff. JM1 component	actual HP/ideal HP
SPEC(7)	= mech. eff. JM2 component	actual HP/ideal HP
SPEC(8)	= mech. eff. JP1 component	actual HP/ideal HP
SPEC(9)	= mech. eff. JP2 component	actual HP/ideal HP
SPEC(10) through SPEC(15)	= BLANK	

NOTE: If one shaft is to be connected to another shaft in order to have more than 4 components on the same shaft, then: the LOWER component number shaft must be the FIRST component of the HIGHER number shaft. At least one TURBINE must be on the HIGHER number shaft. The control on horsepower balance must vary the SHAFT SPEED of the LOWER number shaft to drive DATOUT(8) of the HIGHER number shaft to ZERO!

3.2.1.11 'LOAD'-JTYPE=10

VARIABLE DEFINITION

```
SPEC( 1) = load HP (negative) or Table reference number
SPEC( 2) = propeller effic. or 0.
SPEC( 3) = thrust/SHP at SLS
ALL THE REST ARE BLANK
```

NOTE: there are no JM1, JM2, JP1, JP2 numbers on the KONFIG card, thus: KONFIG(1,N)='LOAD',

3.2.1.12 'CNTL' - JTYPE=12

As previously mentioned, the SPECIFICATION and KONFIG cards for controls differ from those of the other "components"

The configuration card reads:

```
KONFIG(1,N)='CNTL',
```

The specifications are read in as follows:

```
SPCNTL(1,N)=N1,N2,NAME,N3,N4,VALUE,TOL,MINV,MAXV
```

Where:

```
   N1 = the DATINP(N1) of N2 which is to be varied
   N2 = the component number of the component being varied
 NAME = 'STAP' if station property (STATP)
      = 'DOUT' if DATOUT
      = 'PERF' if performance property
   N3 = number of staton property
        or DATOUT(N3)
        or PERFOR(N3)
   N4 = flow station number if 'STAP'
      = component number if 'DOUT'
      = 0 if 'PERF'
VALUE = value to be achieved
  TOL = tolerance as fraction of value, if =1,
        default value of .001 will be used,
        (0.0005 if Optimizing)
        if = zero, control is turned off
 MINV = minimum allowable value - if zero ignored
 MAXV = maximum allowable value - if zero ignored
```

For PERFOR or STATP, the following Table applies:

N3	PERFOR	STATP
1	total engine airflow	weight flow
2	gross jet thrust	total pressure
3	fuel flow	total temperature
4	net jet thrust	fuel to air ratio
5	TSFC	corrected flow $W\sqrt{T}/P = 1.54972555 + W\sqrt{\theta}/\delta$
6	net thrust/airflow	Mach number
7	total inlet drag	static pressure
8	total brake shaft HP	interface corrected flow error
9	net thrust with installation drags	
10	net SFC	
11	inlet drag (lip + spillage)	
12	boattail drag	

You would read the SPCNTL card as follows:

Vary DATINP(N1) of component N2 to make either

a) station property (N3) at flow station(N4) equal to VALUE with tolerance TOL; or
b) DATOUT(N3) of component(N4) equal to VALUE with tolerance TOL; or
c) performance property(N3) equal to VALUE with tolerance TOL

NOTE: in the case of 'STAP' and 'DOUT' controls, N3 will usually equal 8
(flow interface error for STAP, static pressure difference in mixers, delta T error in HX's and net HP error in shafts)

if TOL=0. the control is turned off, to turn it back on see below. SPCNTL input can ONLY be used at the DESIGN POINT. Off-design point data is read in with SPEC data as below.

SPEC(1) = fraction of VALUE used for marching (see MARCHING)
SPEC(2) = minimum allowable value
SPEC(3) = maximum allowable value
SPEC(4) = N1
SPEC(5) = VALUE
SPEC(6) = N3 if 'STAP', otherwise BLANK
SPEC(7) = N3 if 'DOUT', otherwise BLANK
SPEC(8) = N3 if 'PERF', otherwise BLANK
SPEC(9) = TOL, if = 0, control inactive
if value given for TOL, then
control is activated

3.2.1.13 'OPTV' - JTYPE=13

The ability to optimize variables is now possible in NNEP. The form of the KONFIG card for an 'OPTV' is as follows:

KONFIG(1,N)='OPTV',0,0,NC,0,

where NC is the number of the component having the independent variable

The specifications are read in as for normal components

SPEC(1) = BLANK
SPEC(2) = minimum allowable value of the variable
(if = 0, there is no minimum constraint)
SPEC(3) = maximum allowable value of the variable
(if = 0, there is no maximum constraint)
SPEC(4) = a value of 1 to 9 indicating which DATINP
of component NC is the independent variable
SPEC(5 to 8) = BLANK
SPEC(9) = switch to turn ON or OFF this variable
if set=0, this variable is OFF
if set=1, this variable is ON

There are additional inputs to NNEP when 'OPTV' components are present. These are:

TOLOPT - Criteria of convergence on DEPENDENT variable.
Default value is 0.0002

NJOPT - Component number which indicates the location
of the dependent variable (if 0, the dependent
variable is not a DATOUT parameter)

NVOPT - 0 for minimizing , 0 for maximizing
if NJOPT = 0, then NVOPT is a value of
1 to 12 indicating which performance property
is the dependent variable

if NJOPT = 0, then NVOPT has a value of
1 to 9 indicating which DATOUT of
component NJOPT is the dependent variable

To turn off the optimization, NVOPT must be set to 0

As an example of the use of an 'OPTV', let us assume that we have MARCHED to Mach 1.4 at 40000 feet and then throttled back to 50 percent F/Wa.

We can now set SPEC(1,20)=1 to hold the F/Wa at the present value. If we want to minimize the SFC holding F/Wa constant and optimizing TIT, we would do the following.

Assume that component 5 was the main burner, and that we have used only 20 components. We would have created at the beginning another component as follows.

KONFIG(1,21)='OPTV',0,0,5,0,SPEC(1,21)=0,0,0,4,0,0,0,0,0,

which says that DATINP(4) (burner outlet T) of component 5 (the main burner) is the independent variable. There is no minimum value or maximum and since SPEC(9)=0, it is OFF

Now we set SPEC(9,21)=1 and NVOPT=5 to minimize SFC
The max increment in TIT would be = 50 degrees in 1 step

3.2.1.14 <u>'LIMV' - JTYPE=14</u>

Limit Variables

It is now possible to specify minimum and maximum allowable values for any DATOUT, STATION PROPERTY, or PERFORMANCE PROPERTY.

This ability already exists for CONTROL and OPTIMIZATION variables (see 'CNTL' and 'OPTV')

Now, when a limit has been exceeded, a WARNING will be printed on the output sheet.

If optimization is in effect, the criteria of merit will be penalized by a penalty function to drive you away from the boundary.

The form of a 'LIMV' is as follows:

KONFIG(1,N)='LIMV'

The inputs at the DESIGN POINT are:

SPLIMV(1) = BLANK
SPLIMV(2) = minimum allowable value
SPLIMV(3) = maximum allowable value
SPLIMV(4) = 'DOUT', or 'STAP', or 'PERF'
SPLIMV(5) = DATOUT No., or Station Prop. No. or Perfor. No.
SPLIMV(6) = Component No. or Station No. or BLANK
SPLIMV(7) = BLANK
SPLIMV(8) = BLANK
SPLIMV(9) = On/Off switch, 1=on, 0=off

Off-design use SPEC(2) to change minimum value
SPEC(3) to change maximum value
SPEC(9) to turn On and Off

3.2.1.15 MARCHING

A new feature has been added to NNEP. The best way to tell the user about it is to demonstrate its use.

Let us suppose you wish to mak a plot of F/Wa versus nozzle area at Mach 1.4, 40000 feet. You could run the engine at 1.4, 40000, note what F/Wa is, and then use a control on nozzle area to drive F/Wa to various values. The dogwork of doing this has been eliminated as follows.

When you configure the engine, build in a control on nozzle area and F/Wa as follows - suppose component 10 is the nozzle, and if component 20 is the new control,

```
KONFIG(1,20)='cntl',spcntl(1,20)=1,10,"PERF',6,0,anyvalue,0
```

which says - vary DATINP(1) (nozzle area) of component(10) (nozzle) so that performance property(6) (F/Wa) has a value of (doesn't matter) with a tolerance of zero (turns OFF the control)

Then run the engine up to 1.4,40000 feet. Now input the following

```
SPEC(1,20)=f1,SPEC(9,20)=TOL
        followed by
&D     &END
.
.
.
&D    &END
```

What this will do is detect from SPEC(1,20) not equal to 0, that you want to store the last value of PERF(6) in VALUE (the target answer) and will then set

TARGET VALUE=f1 * the present VALUE

Thus, the present value of (F/Wa) is calculated by the program, and DATINP(1) of component(10) will now be used to drive PERF(6) (F/Wa) to the TARGET VALUE. We could at the same time for instance have held thrust constant by putting a control on TIT to make thrust anything and when we came to 1.4,40000 set f1 for this control=1.3.

3.2.2 WATE-2 INPUT VARIABLE DEFINITIONS (NAMELIST W)

VARIABLE	DEFINITION
ISII	= T - SI units input = F - English units input
ISIO	= T - SI units output = F - English units
IOUTCD	= 0 - Short form-engine weight, length, and maximum radius = 1 - Long form-component weights and dimensions and short form = 2 - Debug option and long and short form

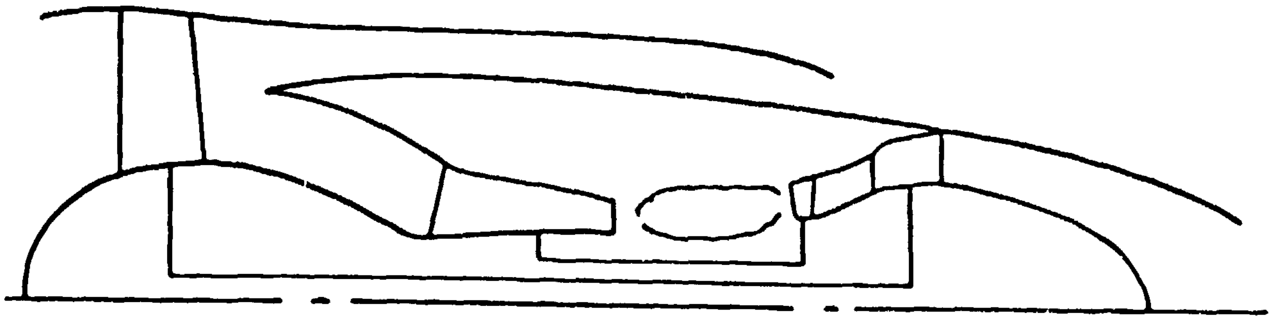
3.2.2.1 LENGTH INDICATORS

The ILENG input specifies only those components that contribute to the total additive engine length. The NNEP component number is specified in ILENG in the order that the components would add in length to achieve the total length. This must start with the first compressor and end with the furthest downstream nozzle. Figure 3 shows a typical engine and the ILENG inputs for that engine. The ILENG input does not include duct (4), nozzle (5) or shafts (13) and (14) because these components do not contribute to the total engine length.

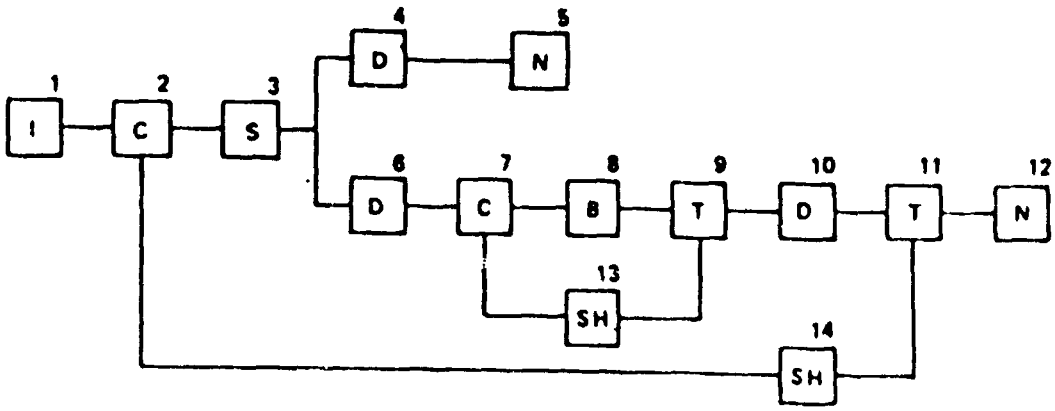
3.2.2.2 MECHANICAL DESIGN INDICATORS

The mechanical design indicators (IWMEC) must be specified for each component of the NNEP simulation, with the exception of the NNEP Controls, Inlet, and Water Injection or any other component not represented in WATE-2.

A number of shaft components may be required to simulate an engine in NNEP. WATE-2 will determine the weight only for connecting shafts of major components, such as the typical HP or LP shaft. The smaller component number must always be used on the inner shaft, with increasing component numbers as concentric shafts are added around the inner shaft.



ENGINE LAYOUT



ILENG (1) = 1,2,3,6,7,8,9,10,11,12.

FLOW PATH AND COMPONENT NUMBERS

Figure 3 WATE-2 Typical Flowpath Input for Engine Length Calculation

IWMEC is a two-dimensional integer array that contains all of the mechanical design indicators. It is of the form IWMEC (N, M), where M is the component number used in NNEP, and N is the variable number as defined below for each component.

3.2.2.2.1 COMPRESSORS

IWMEC Array Location	Description
1	Type of compressor being weighed.
	'FAN' - Typical fan
	'FO' - Outer portion of non-rotating splitter fan
	'FI' - Inner portion of non-rotating splitter fan
	'RSFO' - Outer portion of rotating splitter fan
	'RSFI' - Inner portion of rotating splitter fan
	'LPC' - Low pressure compressor
	'HPC' - High pressure compressor
2	This indicates if the fan or compressor has stators or if the compressor is a centrifugal compressor.
	1 - Stator weight is calculated
	0 - Stator weight is not calculated
	2 - Centrifugal compressor
3	This is the indicator for 'front' frames in compressors. This input may be:
	0 - No frame
	1 - Single bearing frame for turbofans and turbojets with Power Takeoff (PTO)
	2 - Single bearing frame with PTO
	4 - Two bearing frame, such as the frame in front of the HPC in the JT8D or JT9D which extends outward to the fan outer case and holds two bearings with PTO
4	This is the indicator for the 'rear' frame in a compressor
	0 - No frame
	1 - Single bearing frame for turbofans and turbojet without Power Takeoff (PTO)
	2 - Single bearing frame with POT
	4 - Two bearing frame, such as the frame in front of the HPC in the JT8D or JT9D which extends outward to the fan outer case and holds two bearings with PTO

5	This is the component number connecting to this component for split flow compressors only. If this is the Fan Outer, the Fan Inner must be specified. If this is the Rotating Splitter Outer, the inner splitter must be specified, and vice versa.
6	Gear box indicator - 0 - No gear or component number of shaft
7	Number of stages

3.2.2.2.2 TURBINES

IWMEC Array Location	Description
1	This is the type of turbine 'HPT' - High pressure turbine 'LPT' - Low pressure turbine
2	Indicator for turbine exit frame 0 - No frame 1 - Frame
3	Compressor number from which the RPM is determined
4	Component number from which the outer radius limit for the turbine is determined. If the component number is positive, the outlet dimension is used. If negative, the inlet dimension is used. If 0, it will use the outlet of the feeding component.
5	Number of stages
6	Indicator for axial or radial turbine 0 - Axial turbine 2 - Radial turbine

3.2.2.2.3 BURNERS

IWMEC Array Location	Description
1	This is the type of burner being weighed. The input is the burner name in four spaces. 'PBUR' - Primary burner (airframe will be included) 'DBUR' - Duct burner (a mean radius is specified) 'AUG' - Augmentor (no inner wall)

IWMEC Array Location	Description
2	This is the indicator for frame weight, normally only for primary burners. This frame includes a bearing.

0	- No frame
1	- Frame

3.2.2.2.4 DUCTS

IWMEC Array Location	Description	
1	Indicator as to type of duct	
	1	- Dummy - i.e., no weight or length
	2	- Length input
	3	- Length derived as in a duct connecting a splitter and a mixer
	4	- Cross over duct for centrifugal compressors
	5	- Diffuser for centrifugal compressors

3.2.2.2.5 SHAFTS

IWMEC Array Location	Description
1	'SHAF' - Standard shaft
2	Shaft number from inner to outer, i.e., 1, 2, 3, 4, or 5
3-6	Turbine numbers connected to this shaft. The last entry is the furthest downstream turbine. This is used for power summation.
7	First upstream compressor connected to the shaft

3.2.2.2.5 MIXERS

IWMEC Array Location	Description	
1	Type of mixer	
	'MIX'	- The coannular emergence of two streams without mechanical mixer
	'FMIX'	- Forced mixer, mechanical, i.e., Daisy lobed mixer

IWMEC Array Location		Description
2	Indicator for primary input node	
	0	- Primary is inner
	1	- Primary is outer

3.2.2.2.7 NOZZLES

IWMEC Array Location		Description
1	'NOZ'	- Input
2	Nozzle type	
	1	- Convergent
	2	- C-D variable area
3	Component number from which the nozzle inlet diameter can be determined. If this diameter is taken from the inlet of the component, the (-) component number must be entered. If (+), the exit node will be used. If the previous component determines the diameter, this location may be zero.	
4	Thrust reverser type	
	0	- None
	1	- Fan
	2	- Primary

The calculated component weight can be adjusted by an input scaler, DESVAL (15, M), which is a factor applied to the calculated weight. A zero value, however, denotes that no scaling is used. If it is desired to zero-out the weight of a component, the scaler can be set to a trivial quantity such as .0001.

3.2.2.2.8 SPLITTERS

IWMEC Array Location		Description
1	'SPLT'	- Input
2	1	- If inner stream is not primary

3.2.2.2.9 ANNULUS INVERTING VALVE

IWMEC Array Location	Description	
1	Input 'VALV'	
2	Location of Valve	
	1	- Inner
	2	- Outer
3	Component Number of Opposite Duct	
4	0 if Fixed, 1 if Movable	

3.2.2.2.10 HEAT EXCHANGERS

IWMEC Array Location	Description	
1	Input 'HTEX'	
2	Type	
	1	- Fixed tube
	2	- Rotary
3	Flow Direction	
	1	- Parallel flow
	2	- Counter flow

3.2.2.3 DESIGN VALUES

This section contains the mechanical and aerodynamic design data necessary to determine the weight and dimensions of each component. A summary of this array is shown in Table I. If desired, the default values, Table II, can be used for any component by not specifying the inputs for that component. The data required is in the floating-point two-dimensional array DESVAL (N, M), where M is the component number from NNEP and N is as defined below. A typical range of values is shown in Table III.

Design limits are built into the program, as shown in Table IV, and cannot be altered by inputs. If these limits are exceeded, the calculation continues and a warning is printed out.

Table I DESVAL/DEFAUL Array

TYPE \ POSITION	1	2	3	4	5	6	7	8
COMP	MNI	PRM	H/T	SOLID	ARI	ARO	MNO	TMAXI
TURB	MNI	TLP*	SOLID	ARI	ARO	MNO	REFSTR .2% YIELD STRESS FOR DISK	MODE
BURN	VR	TR	DIA MEAN	REFLOC				
DUCTS	MACH	L/H	DIA MEAN	REFLOC				
TRAN/ SHAFTS	STRESS	RHO	H/T					
MIXERS	L/H	NO. PASS						
AIV	L/H	NO. PASS	MNI	MNØ	RH	WTIC	WTOC	WTW
HEATEX	#TUBE	MNIP	MNIS	BPR				
NOZ	L/D							
SPLT	MNI	H/T						

*TLP = $\dfrac{\mu_T^{2}}{2gJ\Delta h/N_{STAGES}}$

TYPE \ POSITION	9	10	11	12	13	14	15
COMP	TMAXO	RPMR	RHO BLADE	MODE	RPMSC	TMET	WEIGHT SCALER
TURB	RPMR						
BURN							
DUCTS							
SHAFTS							
MIXERS							
AIV							
HEATEX							
NOZ							

Table II DEFAUL Array

TYPE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FAN	.55	1.7	.45	1.5	4.	3.	.45	0.	0.	1.	2.	1.	0.	0.	0.
LPC	.5	1.5	.4	1.5	4.	3.	.45	0.	0.	1.	0.	2.	1.	0.	0.
HPC	.4	1.4	.7	1.5	3.	1.5	.3	0.	0.	1.0	0.	2.	1.	0.	0.
HPT	.3	.28	1.5	1.5	1.5	.45	125000.	2.	1.	6*0.					
LPT	.45	.28	1.5	2.	4.	.55	125000.	2.	1.	6*0.					
PBUR	100.	.015	13*0.												
DBUR	150.	.015	13*0.												
AUG	300.	.015	13*0.												
DUCT	.4	1.	0.	-1.	11*0.										
SHAFT	50000.	.286	13*0.												
MIXERS	1.	8.	13*0.												
NOZ	1.	14*0.													
AIV	1.	8.	.5	.5	1.1	1.1	1.1								
HTEX	5000.	.5	.5												

Table III Typical Range of Input Values for DESVAL/DEFAUL

TYPE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FAN	.5-.6	1.5-1.8	.4-.5	1.-1.5	3.-5.	2.-3.	.45-.55	0.	0.	1.	0.	•	1.	0.	•
LPC	.45-.6	1.5-1.8	.4-.5	1.-1.5	3.-5.	2.-3.	.45-.55	0.	0.	1.	0.	•	1.	0.	•
HPC	.4-.5	1.4-1.7	.6-.8	1.-1.5	2.-5.	1.-2.	.2-.3	0.	0.	1.	0.	•	1.	0.	•
HPT	.3-.4	.2-.3	1.-1.5	1.-2.	1.-2.	.45-.5	100 KSI 150 KSI	• •	1.	0.	0.	0.	0.	0.	
LPT	.4-.5	2-.3	1.-1.5	2.-3.	4.-6.	.55-.6	100 KSI 150 KSI	•	1.						
PBUR	100-150	.01-.02	•	•											
DBUR	150-200	.01-.02	•	•											
AUG	200-300	.01-.02	0.	•											
DUCB	.4-.5	•	•	•											
SHAFB	40-50 KSI	.28-.31	0.-.85												
MIXERS	1.-2.	7.-9. ·													
NOZ	1.-2.														
AIV	.8-1.2	6.-10.	.4-.6	.4-.6	•	•									
HTEX	5000.	.3-.5	.3-.5	•											

•NOT APPLICABLE – SEE TEXT

TABLE IV DESLIM ARRAY DEFAUL TYPE AND VALUES

POSITION	TYPE	
	BLADE PULL STRESS CAN NOT EXCEED:	
1	FAN AND COMPRESSOR:	80000 PSI
2	HP TURBINE:	50000 PSI
3	LP TURBINE:	60000 PSI
	HUB/TIP FOR ALL COMPRESSORS CAN NOT EXCEED:	
4	0.93	
	HUB/TIP CAN NOT BE LESS THAN:	
5	FAN AND COMPRESSOR:	0.32
6	TURBINE:	0.50
	TURBINE STAGE LOADING INPUT CAN NOT BE LESS THAN:	
7	TURBINE:	0.28
	FIRST STAGE ALLOWABLE PRESSURE RATIO CAN NOT EXCEED:	
8	FAN:	1.8
9	COMPRESSOR:	1.4
	LAST STAGE EXIT MACH NUMBER CAN NOT EXCEED:	
10	FAN AND COMPRESSOR:	0.6
	BLADE HEIGHT CAN NOT BE LESS THAN:	
11	COMPRESSOR:	0.4 INCH
12-13	NOT USED	

3.2.2.3.1 COMPRESSOR

DESVAL Array Location	Description
1	Compressor face inlet Mach number
2	Maximum first stage pressure ratio
3	Compressor face hub-tip ratio, R_h/R_t
4	Blade solidity, ratio of blade cord to blade spacing
5	Blade aspect ratio at first stage
6	Blade aspect ratio at last stage
7	Compressor exit Mach number
8	Maximum compressor inlet temperature. ZERO if design point temperature is to be used for material selection ^oR, ^oK.
9	Maximum compressor outlet temperature. ZERO if desired point temperature is to be used for material selection ^oR, ^oK.
10	Maximum speed ratio - RPM_{max}/RPM_{design}
11	Blade material density. ZERO if WATE-2 is to select material. lb/in^3, Kg/cc
12	Compressor design type 1. Constant hub radius design 2. Constant mean radius design 3. Constant tip radius design
13	RPM, scaler, normal input is 1. - use to match known RPM of engine
14	Temperature at which a change of material is required. If ZERO 1160^{o}R will be used, ^oR, ^oK.
15	Compressor weight scaler, input ZERO if no scaling is desired
16	Stator blade taper ratio. ZERO input sets 1.8 for fans; 1.2 for compressors
17	Blade volume ratio. ZERO input sets 0.055 for fans; 0.12 for compressors

Centrifugal Compressors

DESVAL Array Location	Description
1	Compressor inlet face Mach number
2	Maximum first stage pressure ratio
3	Compressor hub tip ratio
4	RPM ratio
5	Compressor exit Mach number
6	Gear ratio of the power shaft
7	Horse power of power shaft
8-17	Not used

3.2.2.3.2 TURBINES

DESVAL Array Location	Description
1	Turbine face inlet Mach number
2	Turbine loading parameter $U_T\ /2gJ\Delta h/N$ stages
3	Blade solidity, blade cord/blade spacing
4	Blade aspect ratio of first stage
5	Blade aspect ratio of last stage
6	Turbine exit Mach number
7	Disk reference stress - .2% yield, lb/in2, Newton's/cm2
8	Turbine design type 1. Constant tip radius design 2. Constant mean radius design 3. Constant hub radius design
9	Maximum speed ratio - RPM_{max}/RPM_{design}
10	Turbine control radius inches/cm - blank if transferred from a component

11	Density of material in turbine blades - lb/in3/Kg/cc
12	Blade volume factor. ZERO input sets 0.155 for high and intermediate turbines; 0.195 for low turbines
13-14	Not used
15	Turbine weight scaler, input ZERO. If no scaling is desired
16	Turbine blade taper ratio. ZERO input sets 1.0 for all turbines
17	Stator blade volume factor. ZERO input sets 0.155 for high and intermediate turbines; 0.195 for low turbines

Centrifugal Turbines

DESVAL Array Location	Description
1	Turbine face inlet Mach number
2-5	Not used
6	Turbine exit Mach number
7-17	Not used

3.2.2.3.3 BURNERS

DESVAL Array Location	Description
1	Burner through-flow velocity. ft/sec, m/sec.
2	Burner airflow residency time, sec.
3	Burner mean diameter, in. or cm. If zero, diameter is calculated to match connecting component
4	Component number for calculating mean burner diameter. Enter zero if diameter is specified
5	Number of cans for can burners
6-14	Not used
15	Burner weight scaler, enter ZERO. If no scaling is desired
16-17	Not used

3.2.2.3.4 DUCTS

DESVAL Array Location	Description
1	Duct Mach number
2	Length to height ratio of duct, required if mode 2 is used in IWMEC
3	Duct mean diameter, in. or cm. If 0., duct diameter is calculated based on node specified below
4	Node number to calculate mean diameter. Enter 0, if mean diameter is specified. Enter -1, if connecting component is to be used
5-14	Not used
15	Weight scaler, ZERO. If no scaling is desired
16-17	Not used

3.2.2.3.5 SHAFTS

DESVAL Array Location	Description
1	Shaft allowable stress. lb/in2, Newton's/cm2
2	Shaft material density. lb/in3, Kg/cc
3	Diameter ratio of shaft D_{inner}/D_{outer}
4-7	Component numbers for total spool inertia
8-14	Not used
15	Shaft weight scaler. ZERO if no scaling desired
16-17	Not used

3.2.2.3.6 MIXERS

DESVAL Array Location	Description
1	Effective length to diameter ratio of mechanical mixer, $L/\sqrt{2A/\pi}$, where L is the mixer length inlet to exit, A is the total flow area. Enter 0. if not a mechanical (forced) mixer
2	Number of passages (or lobes) in mixer of either hot or cold stream.
3-14	Not used
15	Weight scaler. Enter ZERO. If no scaling is used
16-17	Not used

3.2.2.3.7 NOZZLES

DESVAL Array Location	Description
1	Length to diameter ratio of nozzle
2	Bypass ratio for mixed flow nozzle for T/R weight
3-14	Not used
15	Weight scaler. ZERO. If no scaling desired
16-17	Not used

3.2.2.3.8 SPLITTERS

DESVAL Array Location	Description
1	Only input if first calculated component in flow path Mach number in.
2	H/T ratio in.
3-14	Blank
15	Weight scaler
16-17	Not used

3.2.2.3.9 ANNULUS INVERTING VALVE

DESVAL Array Location	Description
1	Specific length - $L = \sqrt{4A/\pi}$
2	Number of passages.
3	Mach number of inner passage.
4	Mach number of outer passage.
5	Hub radius in inches/cm or - component number from which hub radius is taken or blank if feeding component determines the hub radius.
6	Inner cylinder weight - lb/ft2, Kg/M2.
7	Outer cylinder weight - lb/ft2, Kg/m2.
8	Wall weight - lb/ft3, Kg/M2.
9-14	Blank.
15	Weight scaler.
16-17	Not used.

3.2.2.3.10 HEAT EXCHANGERS

DESVAL Array Location	Definition
1	Number of tubes if "Fixed" type.
2	Mach number in primary stream.
3	Mach number in secondary stream.
4	Engine Bypass ratio if "Rotary" type.
5-17	Not used.

3.2.2.4 MISCELLANEOUS

ACCS — One-dimensional namelist array that contains the value of the accessory weight scaler. Default value is 0.1.

DESLIM — One-dimensional namelist array that contains the mechanical design limit values for the components. It can have 15 values. First 13 values are defaulted.

DESVAL Array Location	Definition	
ISCALE	One-dimensional namelist integer array which controls the engine scaling logic of the program.	
	ISCALE(1)	Output indicator
	1	Debug option and long and short form for every scaled engine point.
	2	Debug option and long and short form for unscaled engine. Long form for each of the scaled engines.
	ISCALE(2)	Number of scaling points default is three.
	ISCALE(3)	Not used.
SCALE	One-dimensional namelist array that contains values of scaling factors. It can have six values. First three values are defaulted to 1., .8, 1.2.	
ACCARM	Namelist array that contains the value of the centroid distance for the accessories component in the CG calculations. If no value is input, accessories are not included in center of gravity calculations.	
DISKWI	Namelist array that is used as an indicator for the new disk weight method.	
	0	Do disk weight calculations using the old method.
	1	Do disk weight calculations using the new method.

3.2.3 INSTALLATION PROGRAM (INSTAL) INPUTS (NAMELIST I)

VARIABLE	DEFINITION	
INMAP	Inlet map control variable	
	= 0	no inlet map to be used
	= 'name'	name of inlet map to be used (see figure 4)
NOZMAP	Nozzle map control variable	
	= 0	no nozzle map to be used
	= 'name'	name of nozzle map to be used (see figure 5)
CFGMAP	CFG map control variable	
	= 0	no CFG map to be used
	= 'name'	name of C_{F_G} map to be used (see figure 5)
DCDMAP	Delta CD map control variable	
	= 0	no CD map to be used
	= 'name'	name of CD map to be used
DERP	Derivative procedure control variable	
	= 0	do not use derivative procedure
	= 1	use the derivative procedure
MODE	Capture area indicator	
	=0	Capture area input (ACI)
	=1	Program sizes capture area at the designated flight condition
ICFCN	Component number of component directly after inlet (used to determine corrected airflow demanded by engine)	
ACI	Inlet capture area (MODE=0 only, ft.^{2}, m^2)	
INLWT	Inlet weight calculation parameter	
	= 0	do not calculate inlet weight
	= 1	calculate inlet weight
NWC	Nacelle weight calculation parameter	
	= 0	do not calculate nacelle weight
	= 1	calculate nacelle weight
NWD	Nacelle drag calculation parameter	
	= 0	do not calculate nacelle drag
	= 1	calculate nacelle drag
ENGNO	Number of engines for this aircraft configuration	

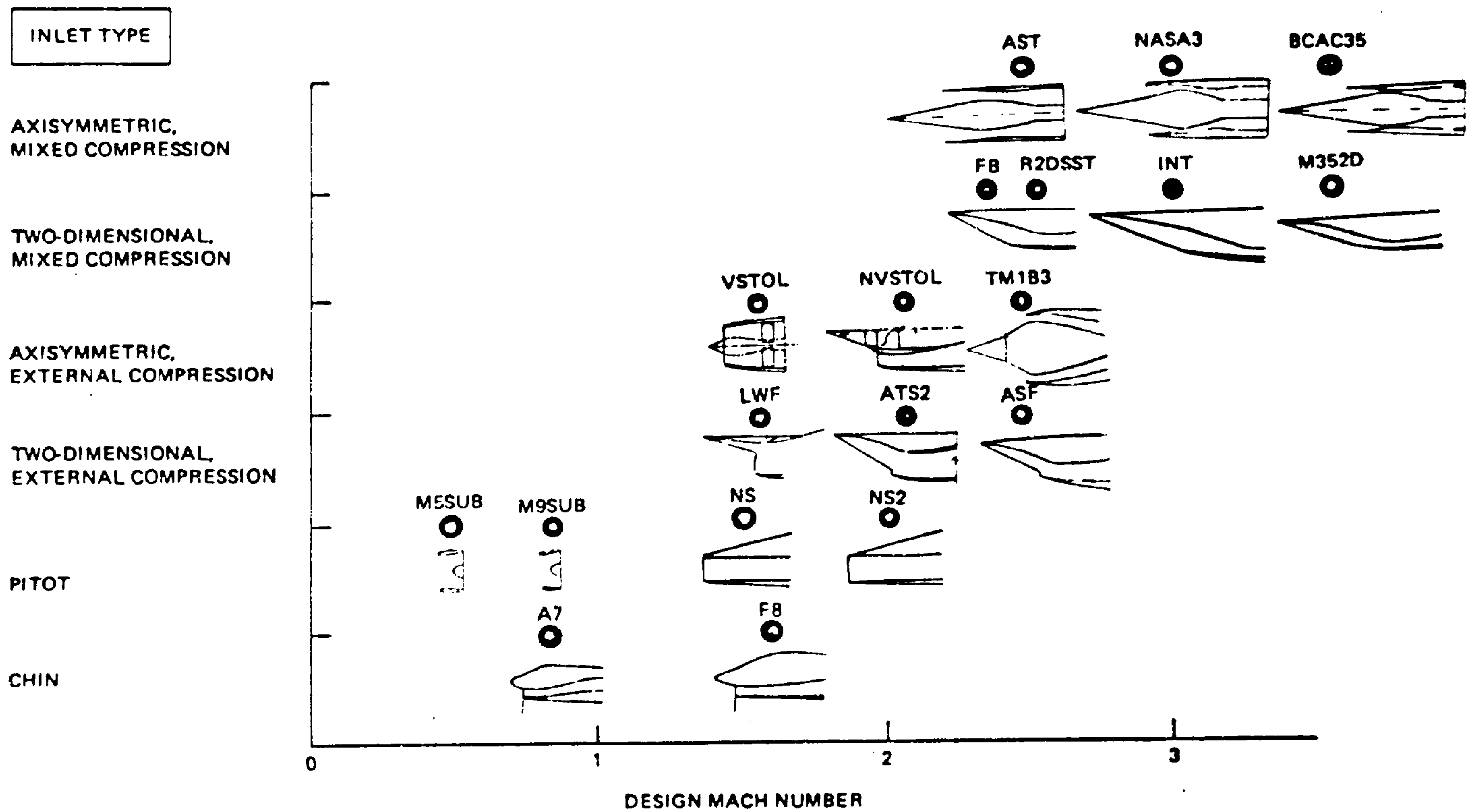


Figure 4 Matrix of Inlet Maps

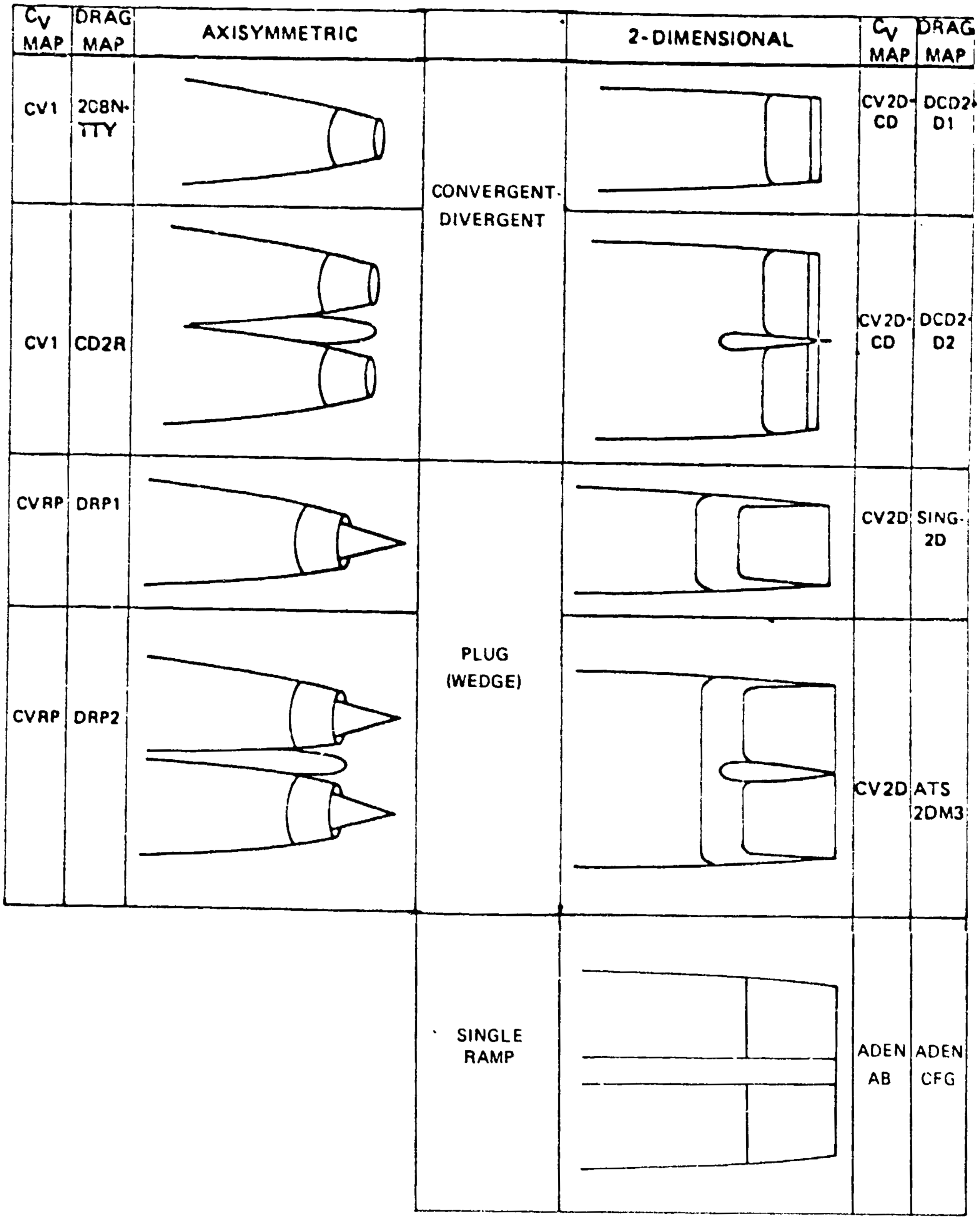


Figure 5 . Matrix of Nozzle/Aftbody Maps

VARIABLE	DEFINITION	
OPTB	Bypass spillage option parameter	
	= 1	all excess inlet airflow spilled externally
	= 2	all excess inlet airflow bypassed above an input Mach number (XMOSBP)
	= 3	use scheduled bypass (Table 7 of Figure 11 in Vol. I) with remainder of inlet airflow spilled
	= 4	determine the optimum combination of bypass and spillage air for a minimum inlet drag
	= 5	determine the optimum combination of bypass and spillage air for a minimum installed specific fuel consumption
XMOSBP	Mach number above which all excess airflow is bypassed (OPTB=2 only)	
TABRF	Recovery and drag maps parameter	
	= 0	use the standard 14 inlet maps
	= 1	use only 2 maps for the inlet
REFMFR	Reference mass flow ratio index	
	= 0	use Tables 3A and 3B
	= 1	for MFR=1.0
OPTBP	Bypass spillage option print flag for options 4 and 5	
	= 0	no intermediate output for options 4 and 5
	= 1	print intermediate output for options 4 and 5
A10A9R	A10 over A9 ratio, aftbody drag reference condition	
A10	Maximum cross-sectional reference area, ft^2, m^2 (Inputed only for body buried engine installations)	
PRINT	Installation print indicator	
	= 0	short form output
	= 1	long form output
UNITI	English or Standard international units option	
	= 0	input variables are in SI units
	= 1	input variables are in English units
UNITO	English or Standard international units option	
	= 0	output variables are in SI units
	= 1	output variables are in English units

VARIABLE	DEFINITION
INLTYP	Inlet design and analysis option = 0 Using the inlet map library, execute the installation procedure only = 1 design and analyze a pitot inlet = 2 design and analyze a two-dimensional inlet = 3 design and analyze an axisymmetric inlet = 4 design and analyze an axisymmetric spike inlet
STOP	Parametric installation option =0 Normal installation =1 Engine is installed at the same flight condition using different inlet and nozzle aftbody maps
SCALE	Factor for scaling airflow-related engine performance data
KVALUE	Surface roughness height (see Table VIII of Final Report, NWD = 1, only)
INOZ	Array of component numbers of nozzles in engine simulation (see Table V)

3.2.4 INLET DESIGN AND ANALYSIS PROGRAMS INPUT DEFINITIONS

The design and analysis procedures available for the two-dimensional, axisymmetric and isentropic spike inlets are basically modifications of the Naval Weapon Center Inlet Design and Analysis program (see Reference 1). These modifications include program conversion to the IBM370 VMS computer system as well as a modification to utilize NAMELIST format for input. The two-dimensional inlet inputs are described in 3.2.4.1 (see figure 6), the axisymmetric inlet inputs are described in 3.2.4.2 (see figure 7), and the isentropic spike inlets are described in 3.2.4.3 (see figure 8).

The design and analysis procedure for PITOT inlets is described in 3.2.3.4.

Type of Turbine Engine	INOZ(1)	INOZ(2)	INOZ(3)	INOZ(4)
Turbojet	Nozzle Component Number	0	0	0
Mixed Flow Turbofan	Nozzle Component Number	0	0	0
Split Stream Turbofan Coplanar Nozzles	Primary Nozzle Component Number	Secondary Nozzle Component Number	0	0
Split Stream Turbofan Non-Coplanar Nozzles	0	0	Primary Nozzle Component Number	Secondary Nozzle Component Number

Table V INOZ Array Values

3.2.4.1 TWO-DIMENSIONAL DESIGN PROGRAM INPUT VARIABLE DEFINITIONS (NAMELIST TD10)

VARIABLE	DEFINITION
KETYPE	Control on type of external compression surface = 1 single ramp = 2 double ramp = 3 triple ramp = 4 isentropic wedge
KANAT	Control on type of inlet configuration = 1 external compression surface only - no duct specified = 2 external compression surface followed by diverging duct = 3 external compression surface followed by converging-diverging duct
KDAB	Control on type of computation desired = 1 analysis over a range of M_0 and = 2 design at a specified value of M_0 = 3 design followed by analysis over a range of M_0 and
KSTØP	Control on query - Last case? = 0 yes ≠ 0 no
KSWC	Control on query - Sidewall contraction computation? = 0 no ≠ 0 yes
KCLR	Control on query - Estimate cowl lip radius? = 0 no ≠ 0 yes
KSPR	Control on query - Estimate sideplate lip radius? = 0 no ≠ 0 yes
KCTH*	Control on query - Estimate necessary cowl thickness?
KSTH*	Control on query - Estimate necessary sideplate thickness? = 0 no = 1 yes - Consider structure made of aluminum = 2 yes - Consider structure made of titanium = 3 yes - Consider structure made of stainless steel = 4 yes - Consider structure made of Inconel
KFAL**	Control on query - Empirical forebody correction? = 0 no ≠ 0 yes
KYAW***	Control on query - Empirical yaw correction? = 0 no ≠ 0 yes

* For a given case these two variables must be identical

** If KFAL = 0, Subroutine FOREB must be written and inserted

*** If KYAW = 0, Subroutine YAW must be written and inserted

VARIABLE	DEFINITION
KCLD	Control on query - Compute cowl lip drag? = 0 no ≠ 0 yes
KCWD	Control on query - Compute cowl wave drag? = 0 no ≠ 0 yes
KSLD	Control on query - Compute sideplate lip drag? = 0 no ≠ 0 yes
KSWD	Control on query - Compute sideplate wave drag? = 0 no ≠ 0 yes
KSSP	Control on query - Compute sidespill airflow and drag? = 0 no ≠ 0 yes
KSP	Control on sideplate geometry = 0 no sideplate = 1 one straight line sideplate = 2 two straight line sideplate
KBLD	Control on query - Estimate boundary layer diverter drag? = 0 no ≠ 0 yes
KNSM	Control on query - Terminal normal shock at throat or downstream of converging-diverging duct? = 0 at throat ≠ 0 downstream
KB(1)	Control on query - Bleed on 2nd ramp? = 0 no ≠ 0 yes
KB(2)	Control on query - Bleed on 3rd ramp? = 0 no ≠ 0 yes

VARIABLE	DEFINITION
KB(3)	Control on query - Bleed on isentropic compression surface? $= 0$ no $\neq 0$ yes
KB(4)	Control on query - Bleed/Bypass at cowl lip plane? $= 0$ no $\neq 0$ yes
KB(5)	Control on query - Bleed/Bypass at throat of C-D duct? $= 0$ no $\neq 0$ yes
SWANG	Sidewall contraction angle - degrees
CLRMD	Design Mach number for use with cowl lip radius estimate
RCHIN	Inlet capture height in inches
CLRAD	Cowl lip radius
SLRMD	Design Mach number for use with sideplate lip radius estimate
RWIN	Inlet width in inches
SLRAD	Sideplate lip radius
SPANG	Sideplate bevel angle - degrees
DEFLIM	Maximum allowable structural deflection of duct walls
SPTH	Sideplate thickness
XP1, YP1	Coords of the origin of a 1 straignt line sideplate or coords of the origin of the 1st straight line of a 2 straight line sideplate
XP2, YP2	Coords of the termination of the 1st straight line of a 2 straight line sideplate - the 2nd straight line will terminate at the cowl lip
NECP	Number of coord points in the external cowl array, _ 25
XEC, YEC	Array of coord points defining the external cowl, the array must begin at the cowl lip
XBSDE, YBSDE	Coords of the innerbody at the end of the subsonic diffuser for a diverging duct (KANAT = 2) case
XCSDE, YCSDE	Coords of the inner cowl at the end of the subsonic diffuser for a diverging duct (KANAT = 2) case

VARIABLE	DEFINITION
NICP	Number of coord points in the internal cowl array, $\leq$ 25
XIC*, YIC	Array of coord points defining the internal cowl, the array must begin at the cowl lip and terminate at the duct throat
NIBP	Number of coord points in the innerbody array, $\leq$ 25
XIB*, YIB	Array of coord points defining the innerbody, the array must begin at the point at which a normal through the cowl lip strikes the innerbody and terminate at the duct throat
XBSDM, YBSDM	Coords of the innerbody at the end of the subsonic diffuser for a C-D duct (KANAT = 3) case
BLDTR	Innerbody boundary layer displacement thickness at the terminal normal shock position for supercritical operation, may be input as 0.0 if unknown
BLMTR	As directly preceding for momentum thickness
BLDTC	Inner cowl boundary layer displacement thickness at the terminal normal shock position for supercritical operation, may be input as 0.0 if unknown
BLMTC	As directly preceding for momentum thickness
XBNSM, YBNSM	Innerbody coords of terminal shock position if shock is located in the diverging portion of a C-D duct
XCNSM, YCNSM	Inner cowl coords of terminal normal shock position of shock is located in the diverging portion of a C-D duct
DIVHT	Boundary layer diverter height (perpendicular to fuselage)
DIVWT	Boundary layer diverter width (parallel to fuselage)
DIVHA	Boundary layer diverter half angle - degrees
DIVDS	Fuselage boundary layer thickness at the boundary layer diverter station
AENB(i)	Entrance area for the i^{th} bleed
FLUSH(i)	Control on query - Does the i_{th} bleed have a flush or protruding exit? = 0.0 flush = 1.0 protruding

* It is necessary that XIC(NICP) = XIB(NIBP), for most cases they differ by a small increment only

VARIABLE	DEFINITION
NV(i)	Control on query - For the i^{th} bleed, do you want to compute the bleed geometry given the mass flow or do you want to compute the mass flow given the geometry? = 0 given geometry, compute the mass flow = 1 given mass flow, compute geometry
AEXB(i)	Exit area for the i^{th} bleed
THELV(i)	Exit angle for the i^{th} bleed - degrees
AEXBMX(i)	Maximum exit area for the i^{th} bleed
AEXBMN(i)	Minimum exit area for the i^{th} bleed
THELMX(i)	Maximum exit angle for the i^{th} bleed - degrees
XCSDM, YCSDM	Coords of the inner cowl at the end of the subsonic diffuser for a C-D duct (KANAT = 3) case
THELMN(i)	Minimum exit angle for the i^{th} bleed - degrees
AOACB(i)	Bleed i mass flow (free stream projection/AC)
KCCATS*	Control on query - Estimate the terminal normal shock - boundary layer viscous losses for an inlet operating with the normal shock train in a constant area throat section initiated at the cowl lip plane? = 0 no = 0 yes - If = 0 KDAB must equal KANAT = 1
XBETU,** YBETU	Innerbody coords at the end of a constant area throat section initiated at the cowl lip plane
XCETU,** YCETU	Inner cowl coords at the end of a constant area throat section initiated at the cowl lip plane
XBSDU,** YBSDU	Innerbody coords at the end of the subsonic diffuser for an inlet with a constant area throat section initiated at the cowl lip plane
XCSDU,** YCSDU	Inner cowl coords at the end of the subsonic diffuser for an inlet with a constant area throat section initiated at the cowl lip plane

* If this option is exercised the inlet geometry must be input in inches.
** Input only if KCCATS = 0

3.2.4.1.1 SINGLE RAMP VARIABLE DEFINITIONS (NAMELIST TD20)

VARIABLE	DEFINITION
XS(1), YS(1)	Coords of leading edge of external compression surface, this point will be translated to the origin of the coordinate system internal to the program
D(1)	First ramp deflection angle - degrees
XCL, YCL	Cowl lip coords
W	Inlet width
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI, AMOSS, AMOF	Initial, stepsize, final values of free stream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned
ALPI, ALPSS, ALPF	Initial, stepsize, final values of angle of attack; for an input of -10, 5, 10 angles of attack of -10, -5, 0, 5, 10 would be automatically scanned

3.2.4.1.2 DOUBLE RAMP VARIABLE DEFINITIONS - KDAB = 1 (NAMELIST TD30)

VARIABLE	DEFINITION
XS(1), YS(1)	Coords of leading edge of external compression surface, this point will be translated to the origin of the coordinate system internal to the program.
XS(2)	Abscissa of 2nd ramp origin
D(1)	First ramp deflection angle - degrees
D(2)	Second ramp deflection angle - degrees
XFOC, YFOC	Wave focal point coords for a design case
XCL, YCL	Cowl lip coords
W	Inlet width
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry

VARIABLE	DEFINITION
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI AMOSS AMOF	Initial, stepsize, final values of free stream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned
ALPI, ALPSS, ALPF	Initial, stepsize, final values of angle of attack; for an input of -10, 5, 10 angles of attack of -10, -5, 0, 5, 10 would be automatically scanned

3.2.4.1.3 DOUBLE RAMP DESIGN VARIABLE DEFINITIONS - KDAB = 2,3 (NAMELIST TD31)

VARIABLE	DEFINITION
XCL, YCL	Cowl lip coordinates
XFOC, YFOC	Wave focal point coordinates for a design case
YLE	External compression surface leading edge coordinate
D(1)	First ramp deflection angle (deg)
D(2)	Second ramp deflection angle (deg)
W	Inlet width
AMDES	Design Mach number
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI, AMOSS, * AMOF	Initial, stepsize, final values of free stream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned
ALPI, ALPSS, * ALPF	Initial, stepsize, final values of angle of attack; for an input of -10, 5, 10 angles of attack of -10, -5, 0, 5, 10 would be automatically scanned.

*Input only if KDAB = 3

3.2.4.1.4 TRIPLE RAMP VARIABLE DEFINITION - KDAB = 1 (NAMELIST TD40)

VARIABLE	DEFINITION
XS(1), YS(1)	Coords of leading edges of external compression surface, this point will be translated to the origin of the coordinate system internal to the program
XS(2)	Abscissa of 2nd ramp origin
XS(3)	Abscissa of 3rd ramp origin
D(1)	First ramp deflection angle (deg)
D(2)	Second ramp deflection angle (deg)
D(3)	Third ramp deflectin angle (deg)
XCL, YCL	Cowl lip coords
W	Inlet width
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI AMOSS, AMOF	Initial, stepsize, final values of free stream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned
ALPI, ALPSS, ALPF	Initial, Stepsize, final values of angle of attack; for an input of -10, 5, 10 angles of attack of -10, -5, 0, 5, 10 would be automatically scanned

3.2.4.1.5 TRIPLE RAMP DESIGN VARIABLE DEFINITIONS - KDAB = 1, 2, 3 (NAMELIST TD41)

VARIABLE	DEFINITION
D(1)	First ramp deflection angle (deg)
D(2)	Second ramp deflection angle (deg)
D(3)	Third ramp deflection angle - degrees
XCL, YCL	Cowl lip coords
W	Inlet width
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
XFOC, YFOC	Wave focal point coordinates for design case
YLE	External compression surface leading edge coordinate for design case
AMDES	Design Mach number
AMOI, AMOSS, AMOF *	Initial, stepsize, final values of free stream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned
ALPI ALPSS, ALPF *	Initial, stepsize, final values of angle of attack; for an input of -10, 5, 10 angles of attack of -10, -5, 0, 5, 10 would be automatically scanned.

*Input only if KDAB = 3

3.2.4.1.6 FOUR RAMP VARIABLE DEFINITIONS -KDAB = 1 (NAMELIST TD50)

VARIABLE	DEFINITION
XS(1), YS(1)	Coords of leading edges of external compression surface, this point will be translated to the origin of the coordinate system internal to the program
XS(2)	Abscissa of second ramp origin
XS(3)	Abscissa of third ramp origin
XS(4)	Abscissa of fourth ramp origin
D(1)	First ramp deflection angle (deg)
D(2)	Second ramp deflection angle (deg)
D(3)	Third ramp deflection angle (deg)
D(4)	Fourth ramp deflection angle (deg)
XCL, YCL	Cowl lip coords
W	Inlet width
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI AMOSS, AMOF	Initial, stepsize, final values of free stream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned
ALPI, ALPSS, ALPF	Initial, stepsize, final values of angle of attack; for an input of -10, 5, 10 angles of attack of -10, -5, 0, 5, 10 would be automatically scanned

3.2.4.1.7 FOUR RAMP DESIGN VARIABLE DEFINITION- KDAB = 2, 3 (NAMELIST TD51)

VARIABLE	DEFINITION
XCL, YCL	Cowl lip coords
W	Inlet width

VARIABLE	DEFINITION
PO	Free stream static prssure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
XFØC, YFØC	Wave focal point coords for a design case
YLE	External compression surface leading edge ordinate for a design case
AMDES	Design Mach number
DEL1	External compression surface leading edge deflection for a design case - degrees
DELISØ	Total isentropic turning for a design case - degrees
AMOI, AMOSS, AMOF *	Initial, stepsize, final values of free stream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned.
ALPI, ALPSS, ALPF *	Initial, stepsize, final values of angle of attack; for an input of -10, 5, 10 angles attack of -10, -5, 0, 5, 10 would be automtically scanned.

*Input for KDAB = 3 only

KETYPE		KANAT		KDAB		KSTOP									
KSWC	KCLR	KSPR	KCTH	KSTH	KFAL	KYAW	KCLD	KCWD	KSLD	KSWD	KSSP	KSP	KBLD	KNSM	
KB(1)		KB(2)		KB(3)		KB(4)		KB(5)							

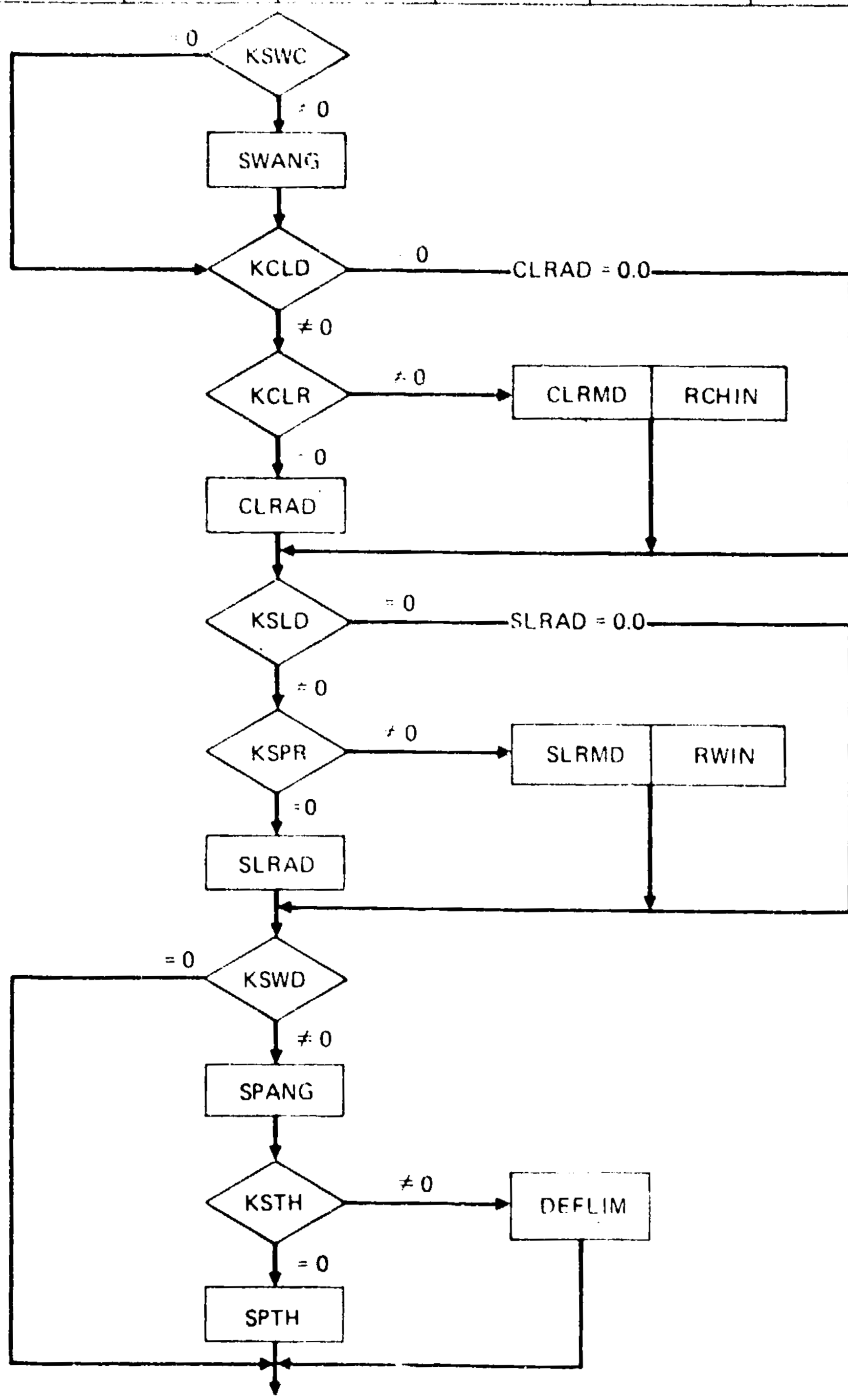


Figure 6. Two-Dimensional Inlet Input Schematic.

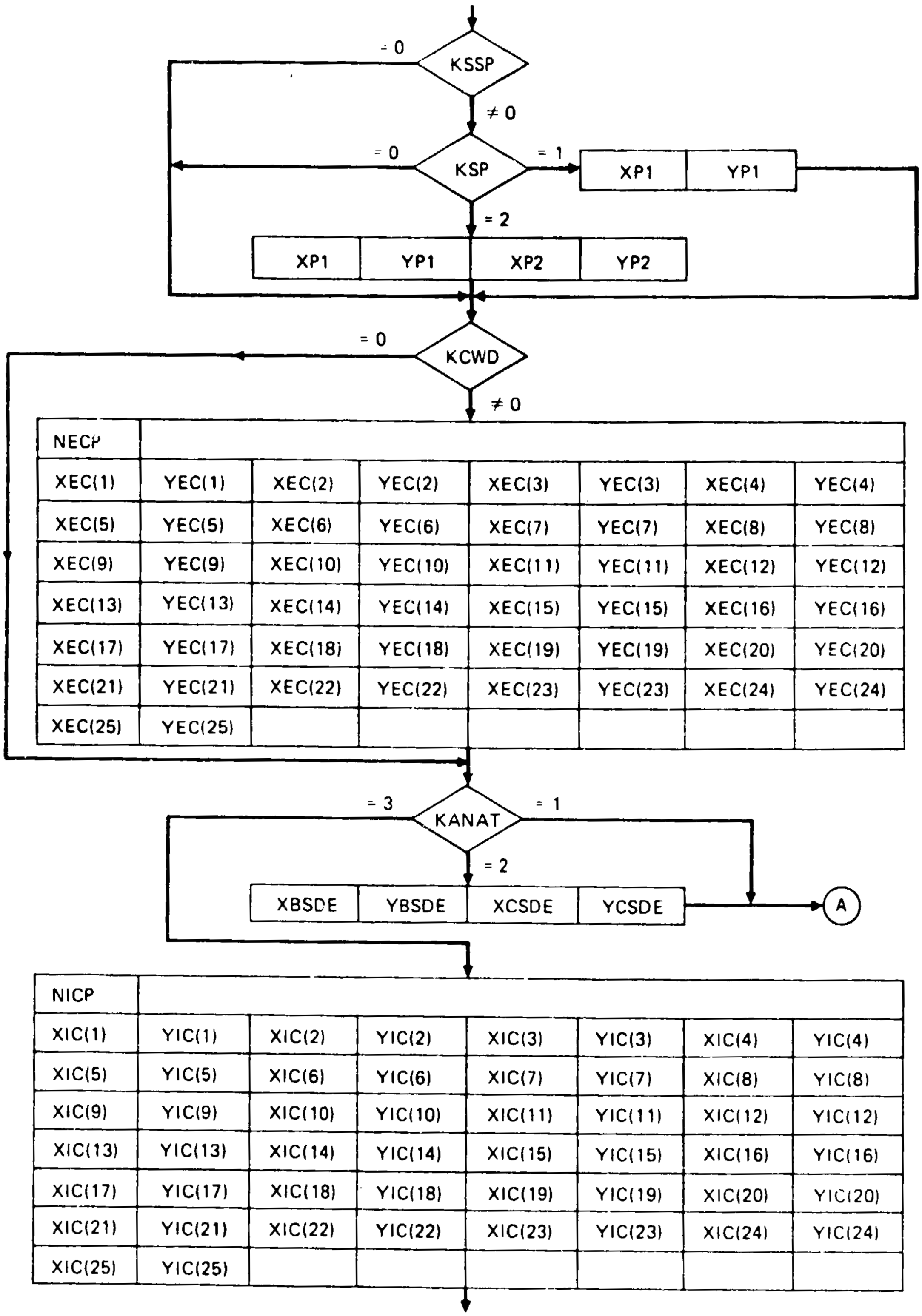


Figure 6. (Contd.) Two-Dimensional Inlet Input Schematic.

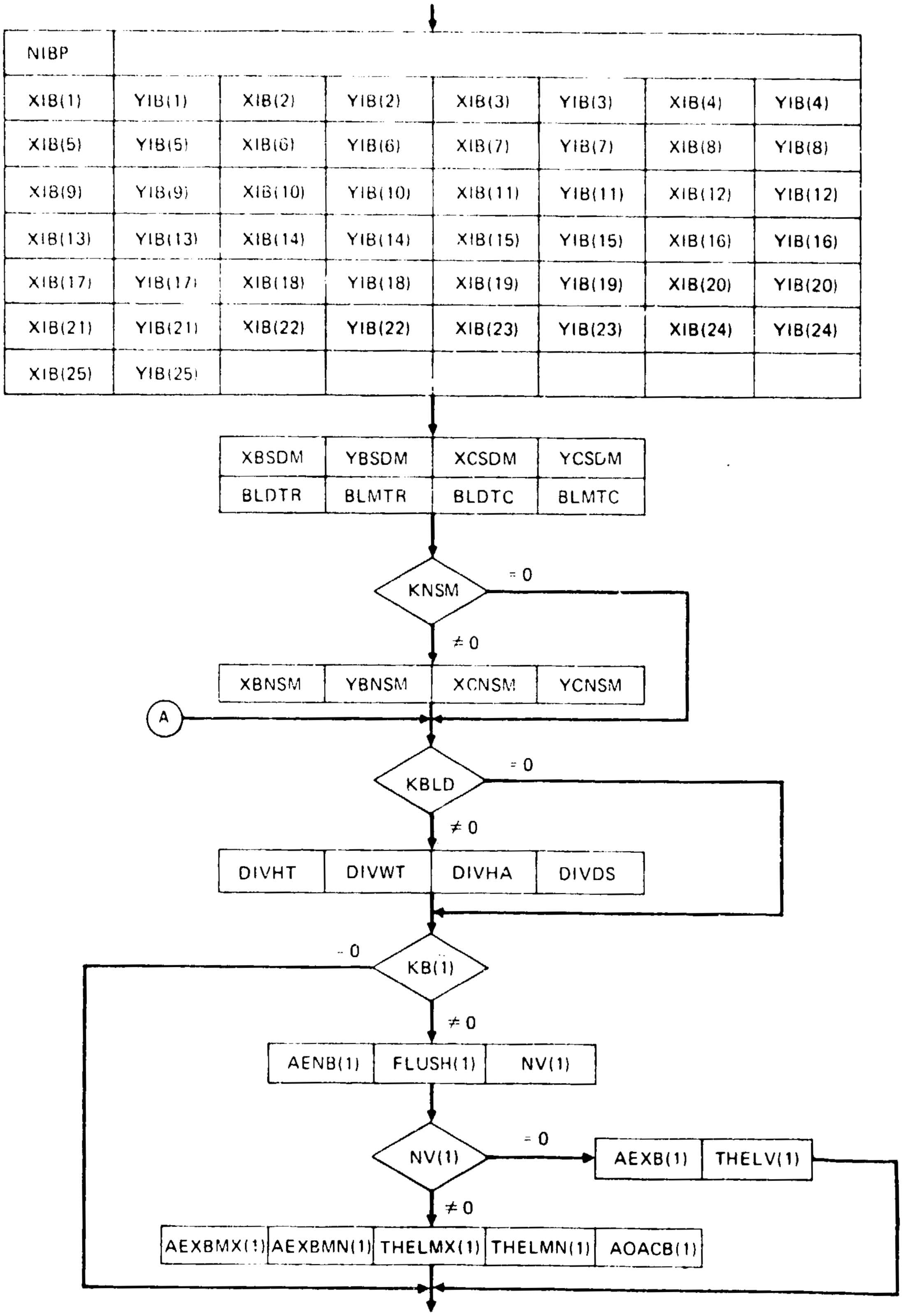


Figure 6. (Contd.) Two-Dimensional Inlet Input Schematic.

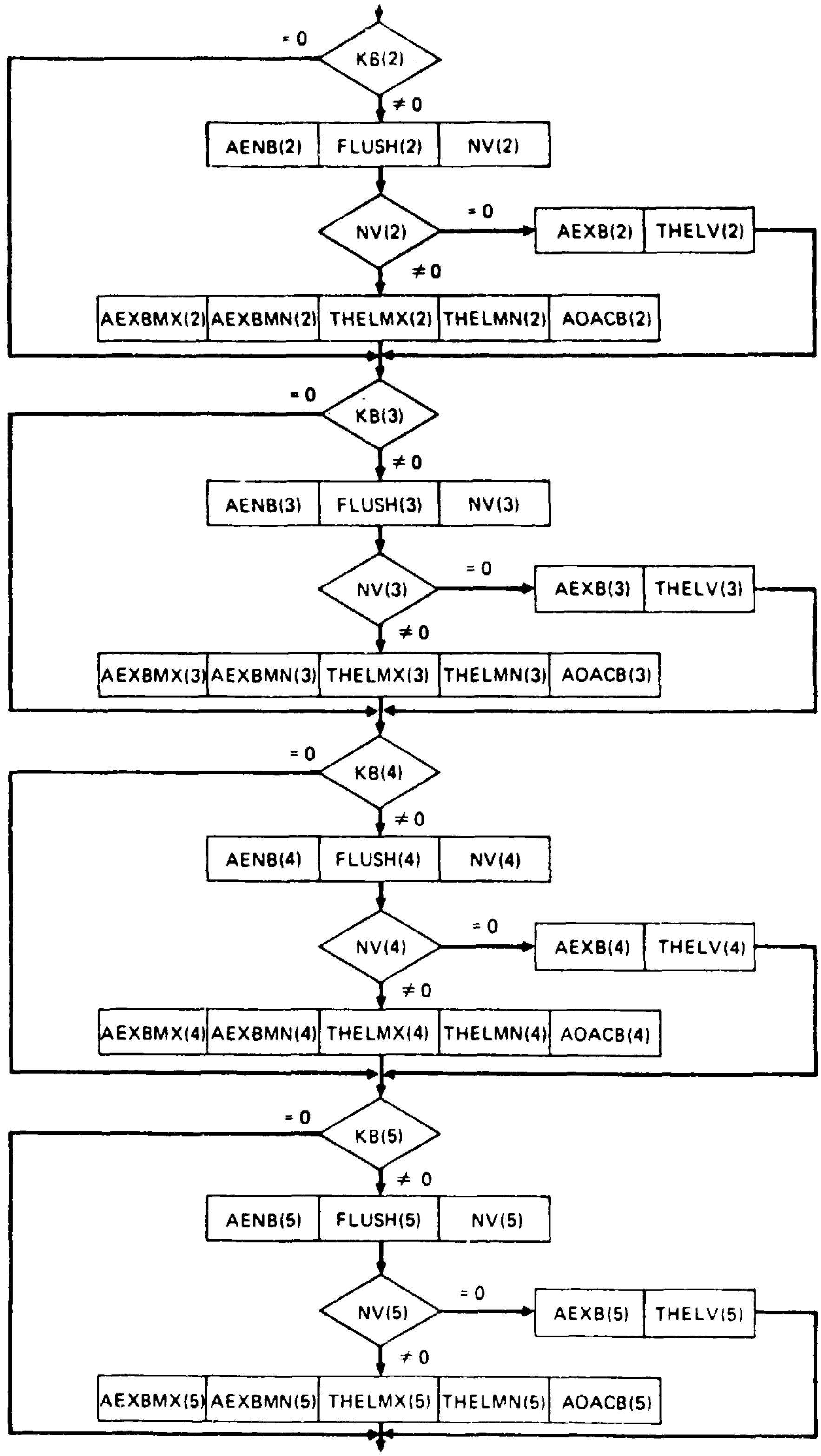
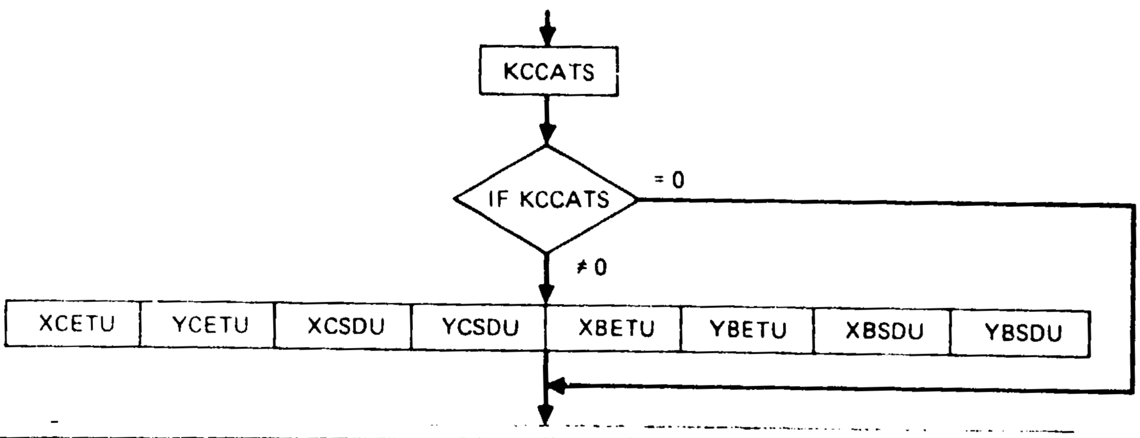


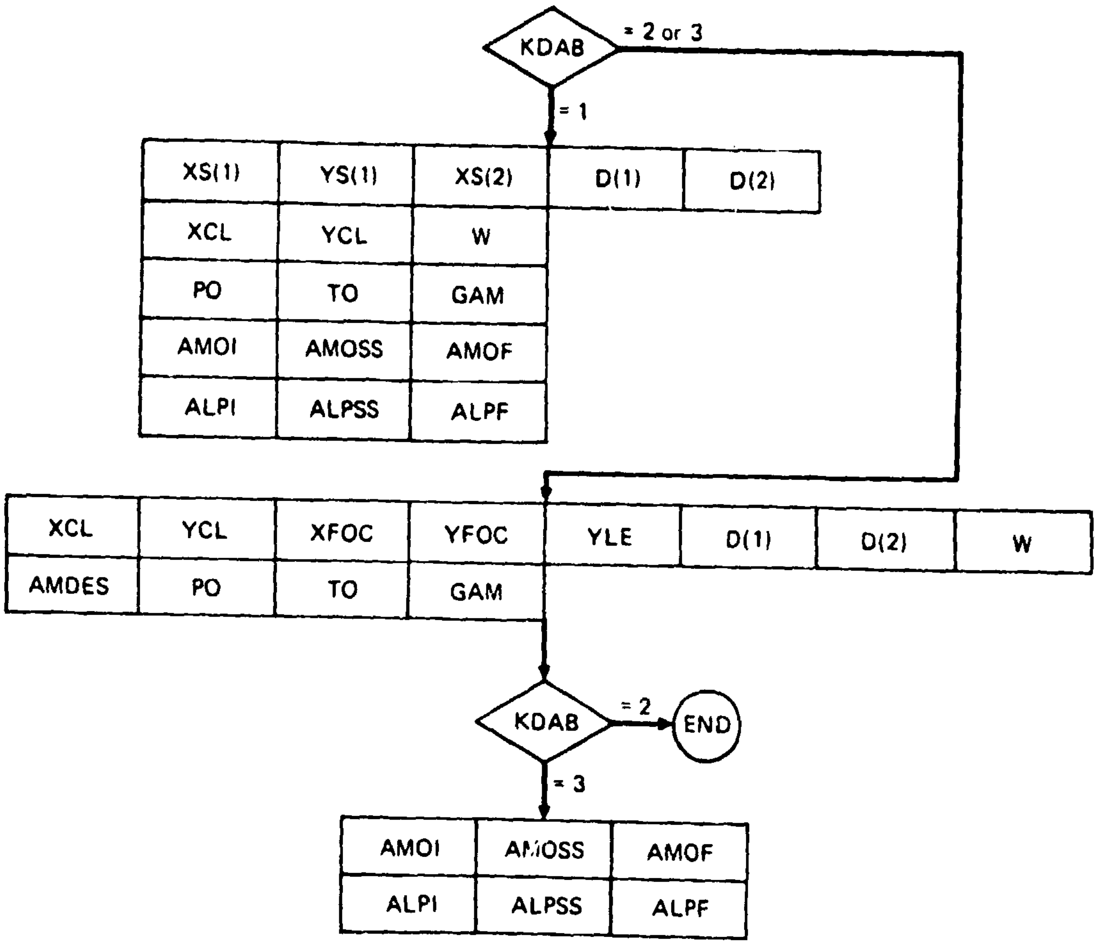
Figure 6. (Contd.) Two-Dimensional Inlet Input Schematic.



XS(1)	YS(1)	D(1)	XCL	YCL	W		
PO	TO	GAM					
AMOI	AMOSS	AMOF					
ALPI	ALPSS	ALPF					

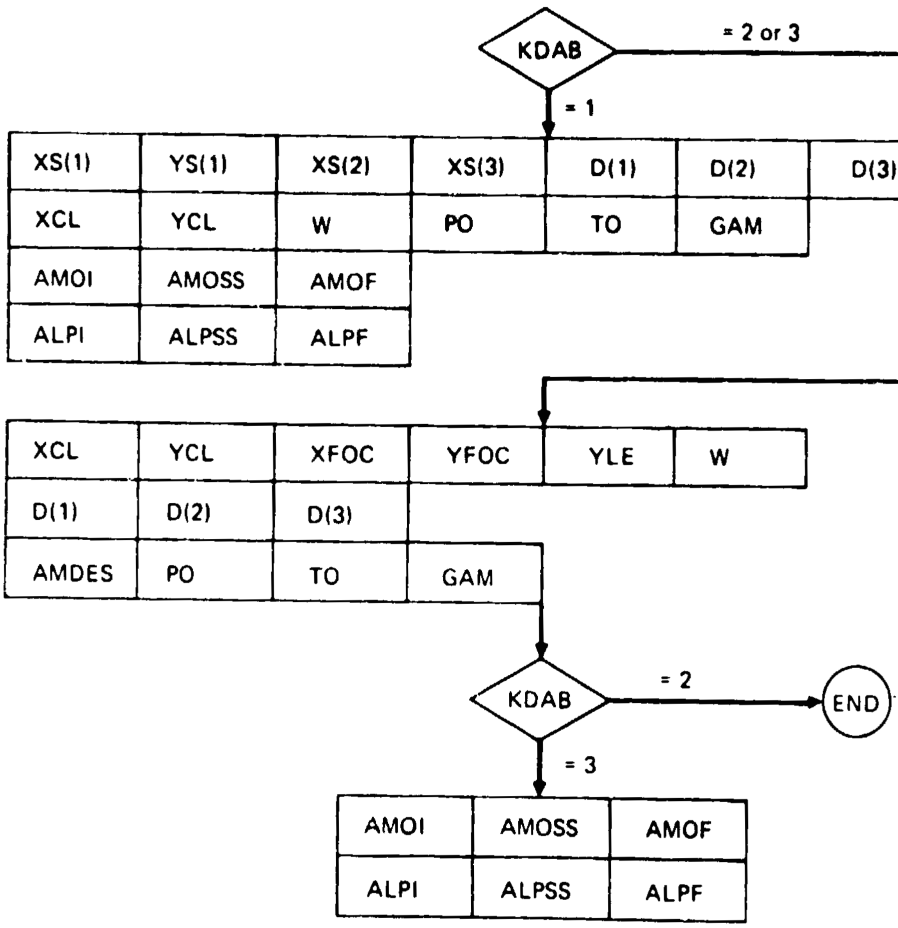
Single Ramp Inlets

Figure 6. (Contd.) Two-Dimensional Inlet Input Schematic.



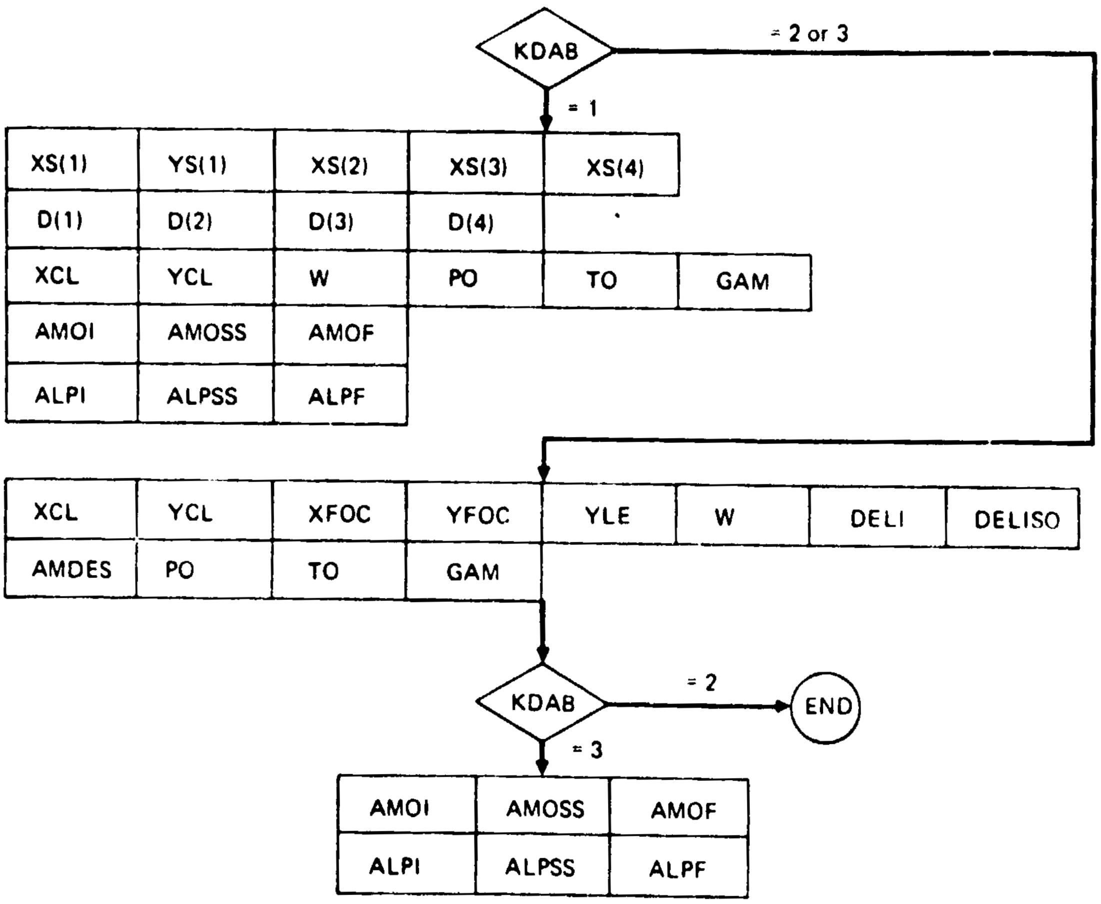
Double Ramp Inlets

Figure 6. (Contd.) Two-Dimensional Inlet Input Schematic.



Triple Ramp Inlets

Figure 6. (Contd.) Two-Dimensional Inlet Input Schematic.



Isentropic Ramp Inlet

Figure 6. (Contd.) Two-Dimensional Inlet Input Schematic.

3.2.4.2 ASISYMMETRIC DESIGN PROGRAM INPUT VARIABLE DEFINITIONS (NAMELIST AXIIO)

VARIABLE	DEFINITION
KETYPE	Control on type of external compression surface = 1 single cone = 2 double cone = 3 triple cone
KANAT	Control on type of inlet configuration = 1 external compression surface only - no duct specified = 2 external compression surface followed by diverging duct = 3 external compression surface followed by converging-diverging duct
KDAB	Control on type of computation desired = 1 analysis over a range of M_0 = 2 design at a specified value of M_0 = 3 design followed by analysis over a range of M_0
KSTOP	Control on query - Last case? = 0 yes ≠ 0 no
KCLWD	Control on query - Compute cowl lip and wave drag? = 0 no ≠ 0 yes
KBLD	Control on query - Estimate boundary layer diverter drag? = 0 no ≠ 0 yes
KPOL	Control on query - Estimate shock/boundary layer interaction losses at the normal shock when KANAT = 3? = 0 no = 1 yes
KNSM	Control on query - Terminal normal shock at throat or downstream of converging-diverging duct? = 0 at throat ≠ 0 downstream

VARIABLE	DEFINITION
KB(1)	Control on query - Bleed on 2nd cone? = 0 no ≠ 0 yes
KB(2)	Control on query - Bleed on 3rd cone? = 0 no ≠ 0 yes
KB(3)	Not used - always set equal to 0
KB(4)	Control on query - Bleed/Bypass at cowl lip plane = 0 no ≠ 0 yes
KB(5)	Control on query - Bleed/Bypass at throat of C-D duct? = 0 no ≠ 0 yes
DLIP	Cowl lip diameter
NCP	Number of coord points in the external cowl array, ≤ 25
XEC, YEC	Array of coord points defining the external cowl, the array must begin at the cowl lip
NICP	Number of coord points in the internal cowl array, ≤ 25
XIC*, YIC	Array of coord points defining the internal cowl, the array must begin at the cowl lip and terminate at the duct throat
IBP	Number of coord points in the innerbody array, ≤ 25
XIB*, YIB	Array of coord points defining the innerbody, the array must begin at the point at which a normal through the cowl lip strikes the innerbody and terminate at the duct throat
ROSDM RISDM XSDM	Coords at the end of the subsonic diffuser for a C-D duct (KANAT = 3) case
BLDTR	Innerbody boundary layer displacement thickness at the terminal normal shock position for supercritical operation, may be input as 0.0 if unknown

* It is necessary that XIC(NICP) = XIB(NIBP), for most cases they differ by a small increment only.

VARIABLE	DEFINITION
BLMTR	As directly preceding for momentum thickness
BLDTC	Inner cowl boundary layer displacement thickness at the terminal normal shock position for supercritical operation, may be input as 0.0 if unknown
BLMTC	Inner cowl boundary layer displacement thickness at the terminal normal shock position for supercritical operation, may be input as 0.0 if unknown
XNSM RINSM RØNSM	Coords of terminal shock position if shock is located in the diverging portion of a C-D duct
XSDE RISDE RØSDE	Coords of subsonic diffuser exit for diverging ducts (KANAT = 2) case
DIVHT	Boundary layer diverter height (perpendicular to fuselage)
DIVWT	Boundary layer diverter width (parallel to fuselage)
DIVHA	Boundary layer diverter half angle - degrees
DIVDS	Fuselage boundary layer thickness at the boundary layer diverter station
AENB(i)	Entrance area for the i^{th} bleed
FLUSH(i)	Control on query - Does the i^{th} bleed have a flush or protruding exit? = 0.0 flush = 1.0 protruding
NV(i)	Control on query - For the i^{th} bleed do we wish to compute the bleed geometry given the mass flow or do we wish to compute the mass flow given the geometry? = 0 given geometry, compute the mass flow = 1 given mass flow, compute geometry
AEXB(i)	Exit area for the i^{th} bleed
THELV(i)	Exit angle for the i^{th} bleed
AEXBMX(i)	Maximum exit area for the i^{th} bleed
AEXBMN(i)	Minimum exit area for the i^{th}bleed
THELMX(i)	Maximum exit angle for the i^{th} bleed - degrees

VARIABLE	DEFINITION
THELMN(i)	Minimum exit angle for the i^{th} bleed - degrees
AOACB(i)	Bleed i mass flow (free stream projection/AC)
KCCATS*	Control on query - Estimate the terminal normal shock - boundary layer viscous losses for an inlet operating with the normal shock train in a constant area throat section initiated at the cowl lip plane? = 0 no ≠ 0 yes - If ≠ 0 KDAB must equal KANAT = 1
XBETU, YBETU	Innerbody coords at the end of a constant area throat section initiated at the cowl lip plane
XCETU, YCETU	Inner cowl coords at the end of a constant area throat section initiated at the cowl lip plane
XBSDU, YBSDU	Innerbody coords at the end of the subsonic diffuser for an inlet with a constant area throat section initiated at the cowl lip plane
XCSDU, YCSDU	Inner cowl coords at the end of the subsonic diffuser for an inlet with a constant area throat section initiated at the cowl lip plane

3.2.4.2.1 SINGLE CONE VARIABLE DEFINITIONS (NAMELIST AXI20)

VARIABLE	DEFINITION
XS(1), YS(1)	Coords of leading edge of external compression surface NOTE: YS(1) always = 0.0
D(1)	First ramp deflection angle - degrees
XLIP, YLIP	Cowl lip coords
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI AMOSS AMOF	Initial, stepsize, final values of freestream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned

* If this option is exercised, the inlet geometry must be input in inches.

3.2.4.2.2 DOUBLE CONE VARIABLE DEFINITIONS -KDAB = 1 (NAMELIST AXI30)

VARIABLE	DEFINITION
XS(1), YS(1)	Coords of leading edge of external compression surface NOTE: YS(1) always = 0.0
XS(2)	Abscissa of 2nd ramp origin
D(1)	First ramp deflection angle - degrees
D(2)	Second ramp deflection angle - degrees
XLIP, YLIP	Cowl lip coords
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI AMOSS AMOF	Initial, stepsize, final values of freestream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned

3.2.4.2.3 DOUBLE CONE DESIGN INPUT VARIABLE DEFINITIONS -KDAB =2, 3 (NAMELIST AXI31)

VARIABLE	DEFINITION
YS(1),	Abscissa of leading edge of external compression surface
D(1)	First ramp deflection angle - degrees
D(2)	Second ramp deflection angle - degrees
XLIP, YLIP	Cowl lip coords
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma

VARIABLE	DEFINITION
AMOI AMOSS * AMOF	Initial, stepsize, final values of freestream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned
XFOC, YFOC	Wave focal point coords for a design case
AMDES	Design Mach number

3.2.4.2.4 TRIPLE CONE INPUT VARIABLE DEFINITIONS -KDAB = 1 (NAMELIST AXI40)

VARIABLE	DEFINITION
XS(1), YS(1)	Coords of leading edge of external compression surface NOTE: YS(1) always = 0.0
XS(2)	Abscissa of 2nd ramp origin
XS(3)	Abscissa of 3rd ramp origin
D(1)	First ramp deflection angle - degrees
D(2)	Second ramp deflection angle - degrees
D(3)	Third ramp deflection angle - degrees
XLIP, YLIP	Cowl lip coords
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI, AMOSS, * AMO,F	Initial, stepsize, final values of freestream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned

* Input only if KDAB = 3

3.2.4.2.5 TRIPLE CONE DESIGN INPUT VARIABLE DEFINITIONS -KDAB = 2, 3 (NAMELIST AXI41)

VARIABLE	DEFINITION
YS(1)	Abscissa of leading edge of external compression surface

VARIABLE	DEFINITION
D(1)	First ramp deflection angle - degrees
D(2)	Second ramp deflection angle - degrees
D(3)	Third ramp deflection angle - degrees
XLIP, YLIP	Cowl lip coords
PO	Free stream static pressure - F/L^2, the L in this input variable must correspond to the units used to input the inlet geometry
TO	Free stream static temperature - degrees Rankine
GAM	Gamma
AMOI AMOSS * AMOF	Initial, stepsize, final values of freestream Mach number; for an input of 1.5, 1.0, 3.5 Mach numbers of 1.5, 2.5, 3.5 would be automatically scanned
XFOC, YFOC	Wave focal point coords for a design case
AMDES	Design mach number

* Input only if KDAB = 3

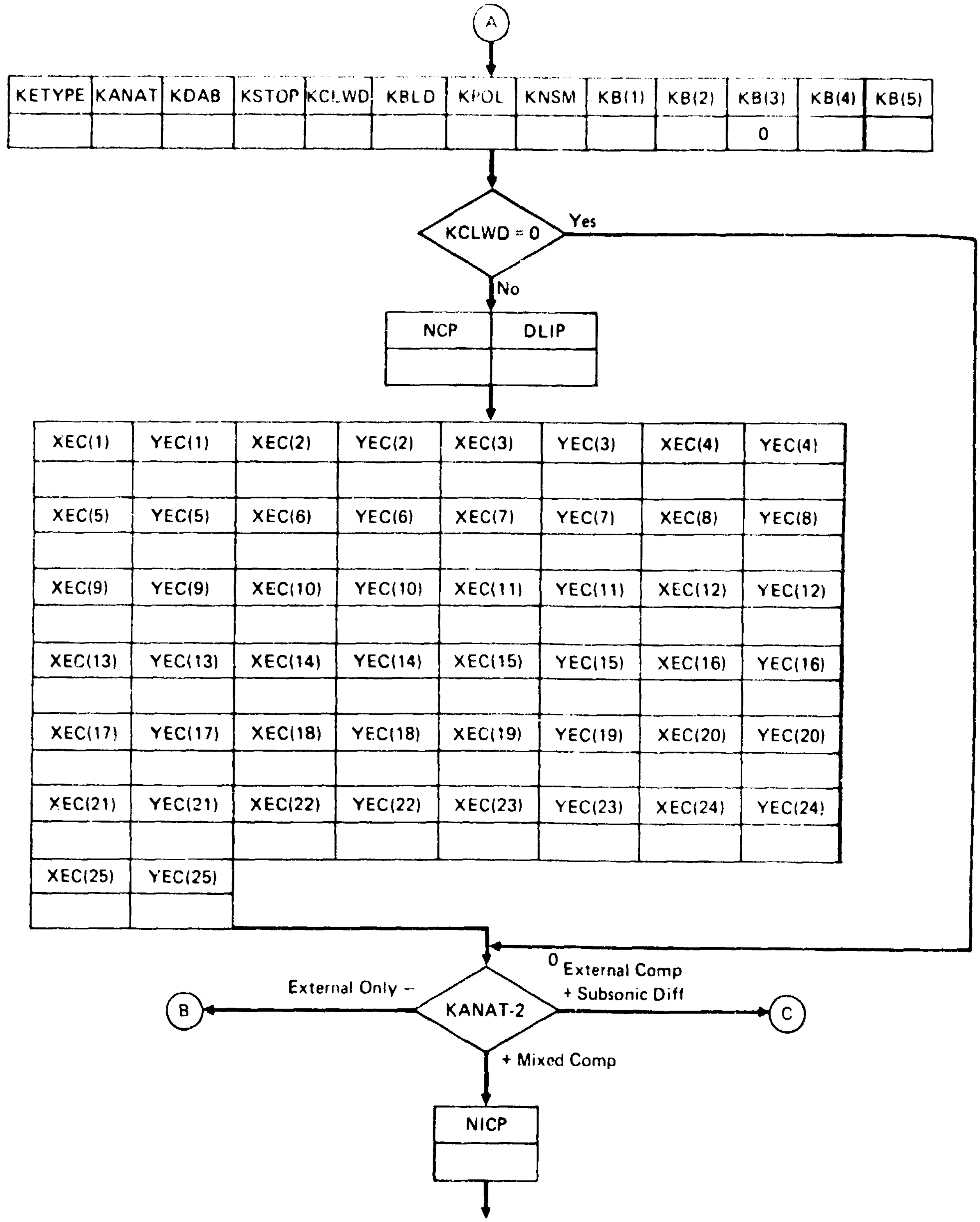


Figure 7. Program AXI Input Schematic.

XIC(1)	YIC(1)	XIC(2)	YIC(2)	XIC(3)	YIC(3)	XIC(4)	XIC(4)
XIC(5)	YIC(5)	XIC(6)	YIC(6)	XIC(7)	YIC(7)	XIC(8)	YIC(8)
XIC(9)	YIC(9)	XIC(10)	YIC(10)	XIC(11)	YIC(11)	XIC(12)	YIC(12)
XIC(13)	YIC(13)	XIC(14)	YIC(14)	XIC(15)	YIC(15)	XIC(16)	YIC(16)
XIC(17)	YIC(17)	XIC(18)	YIC(18)	XIC(19)	YIC(19)	XIC(20)	YIC(20)
XIC(21)	YIC(21)	XIC(22)	YIC(22)	XIC(23)	YIC(23)	XIC(24)	YIC(24)
XIC(25)	YIC(25)						

NIBP

XIB(1)	YIB(1)	XIB(2)	YIB(2)	XIB(3)	YIB(3)	XIB(4)	YIB(4)
XIB(5)	YIB(5)	XIB(6)	YIB(6)	XIB(7)	YIB(7)	XIB(8)	YIB(8)
XIB(9)	YIB(9)	XIB(10)	YIB(10)	XIB(11)	YIB(11)	XIB(12)	YIB(12)
XIB(13)	YIB(13)	XIB(14)	YIB(14)	XIB(15)	YIB(15)	XIB(16)	YIB(16)
XIB(17)	YIB(17)	XIB(18)	YIB(18)	XIB(19)	YIB(19)	XIB(20)	YIB(20)
XIB(21)	YIB(21)	XIB(22)	YIB(22)	XIB(23)	YIB(23)	XIB(24)	YIB(24)
XIB(25)	YIB(25)						

Figure 7. (Contd.) Program AXI Input Schematic.

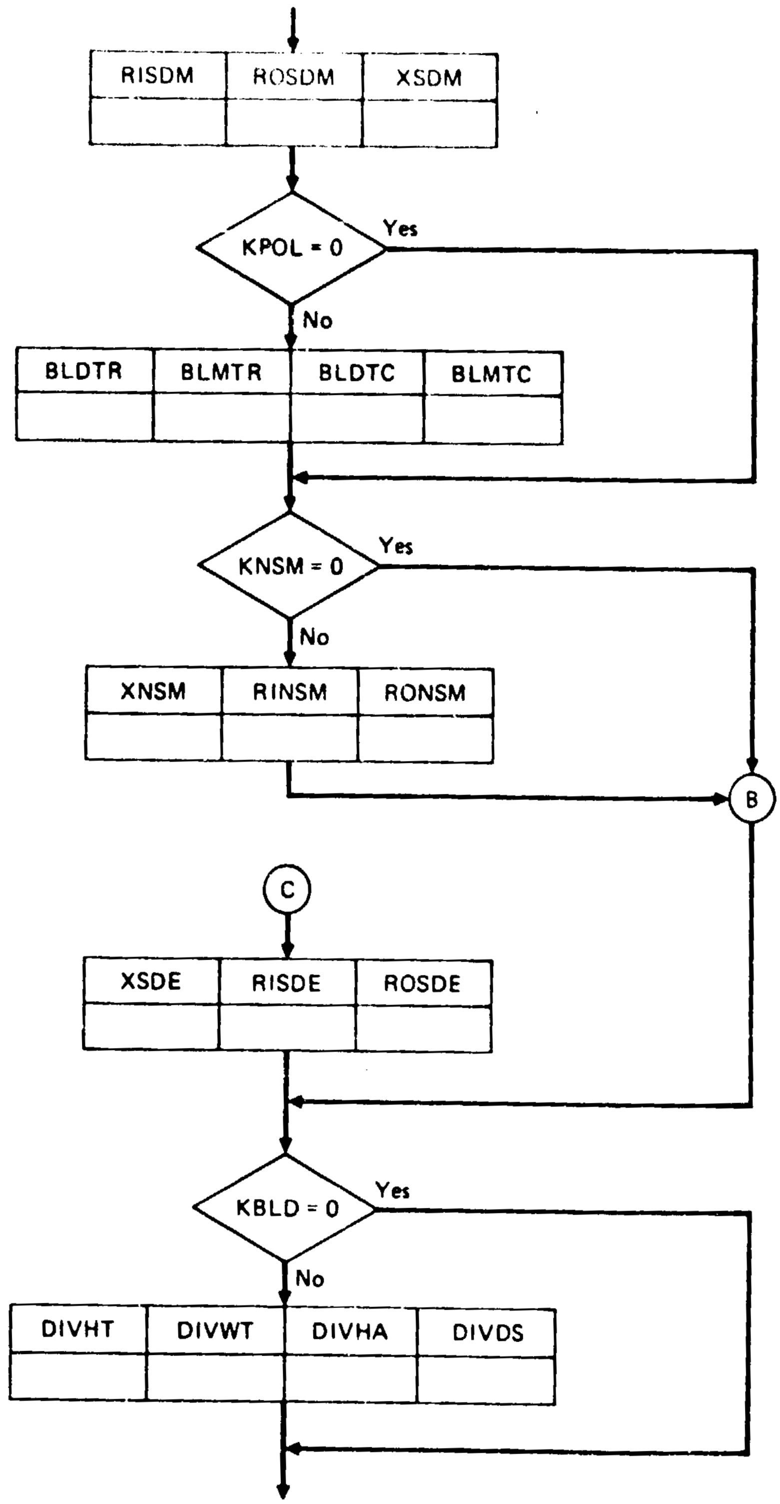


Figure 7. (Contd.) Program AXI Input Schematic.

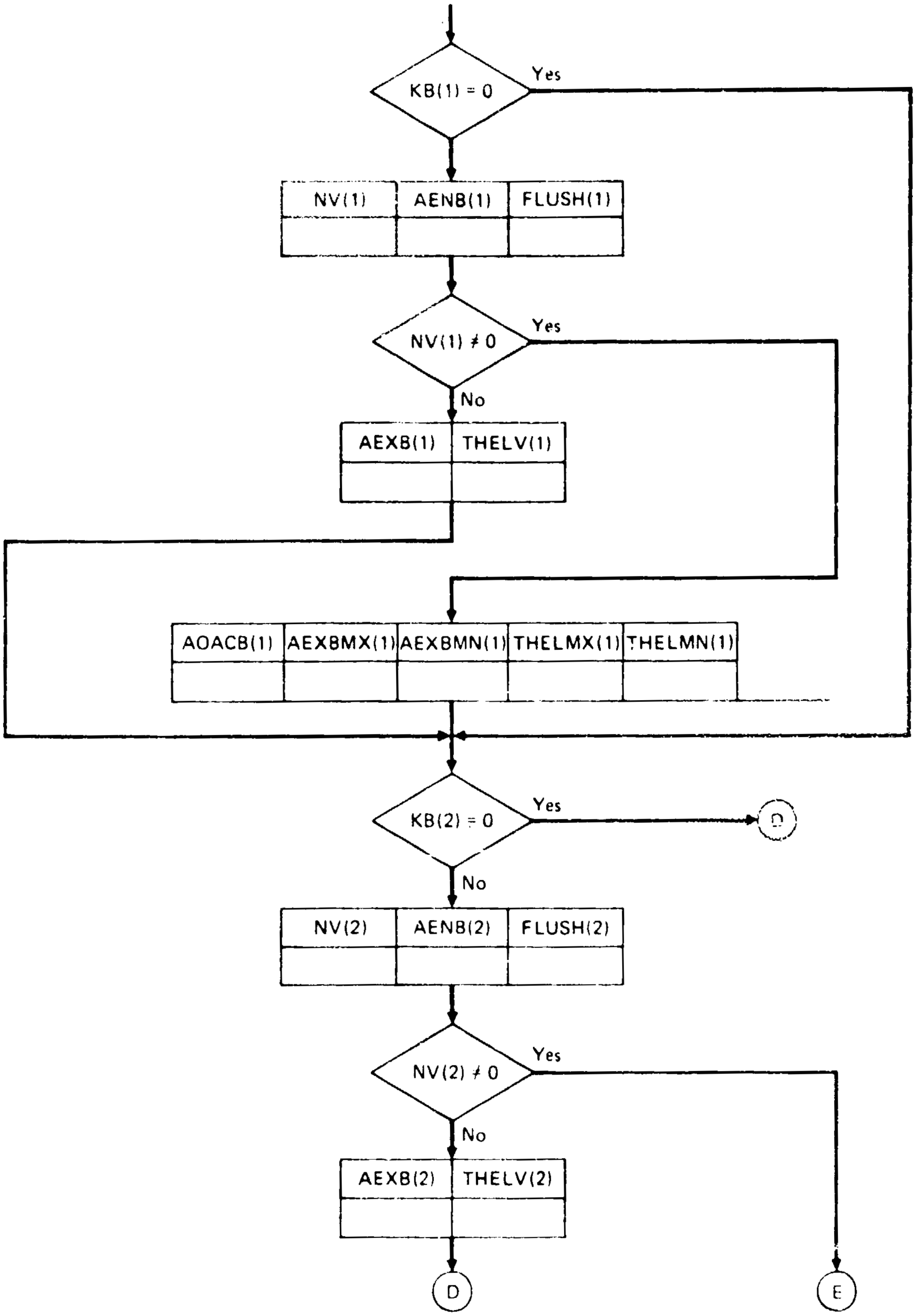


Figure 7. (Contd.) Program AXI Input Schematic.

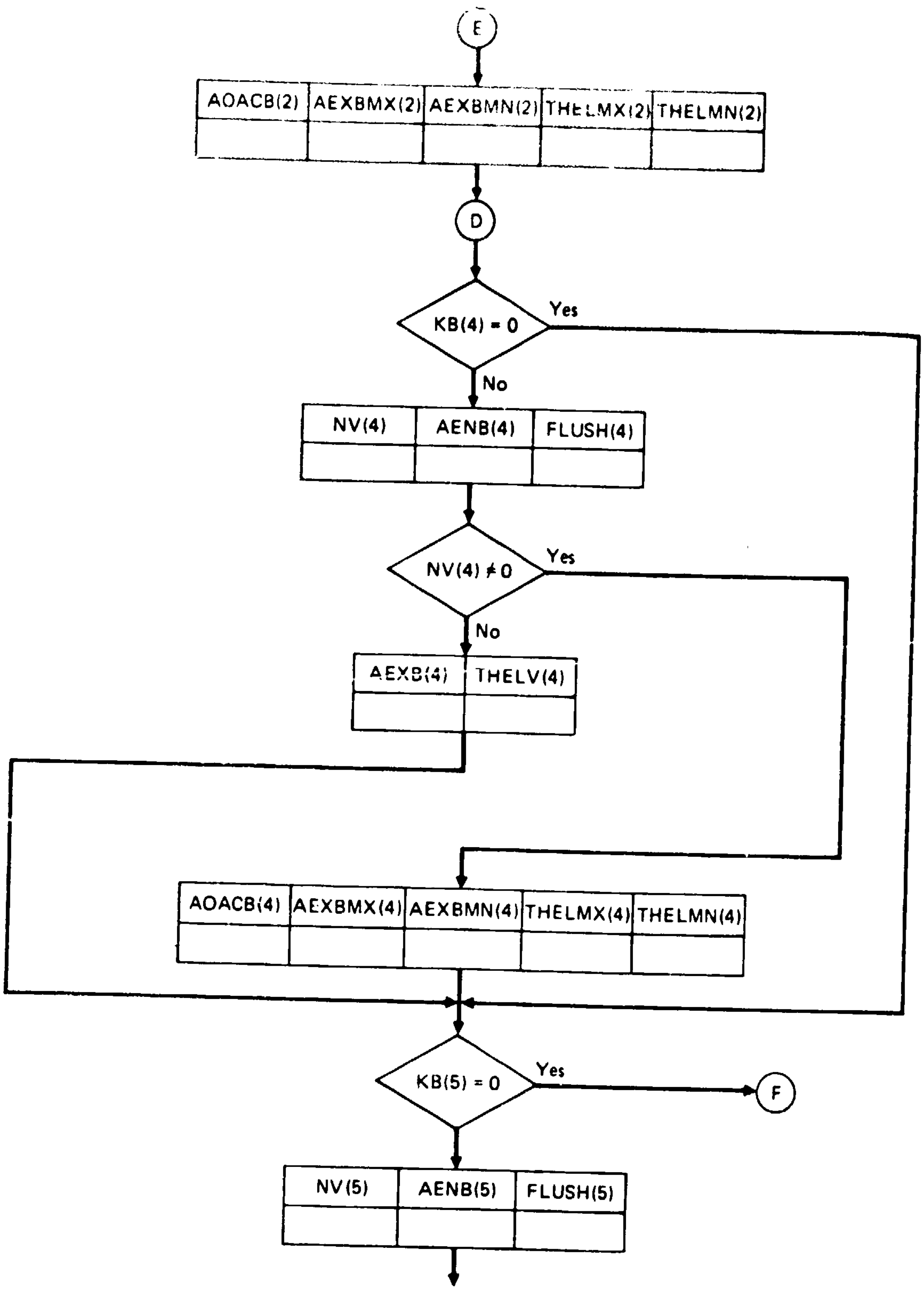


Figure 7. (Contd.) Program AXI Input Schematic.

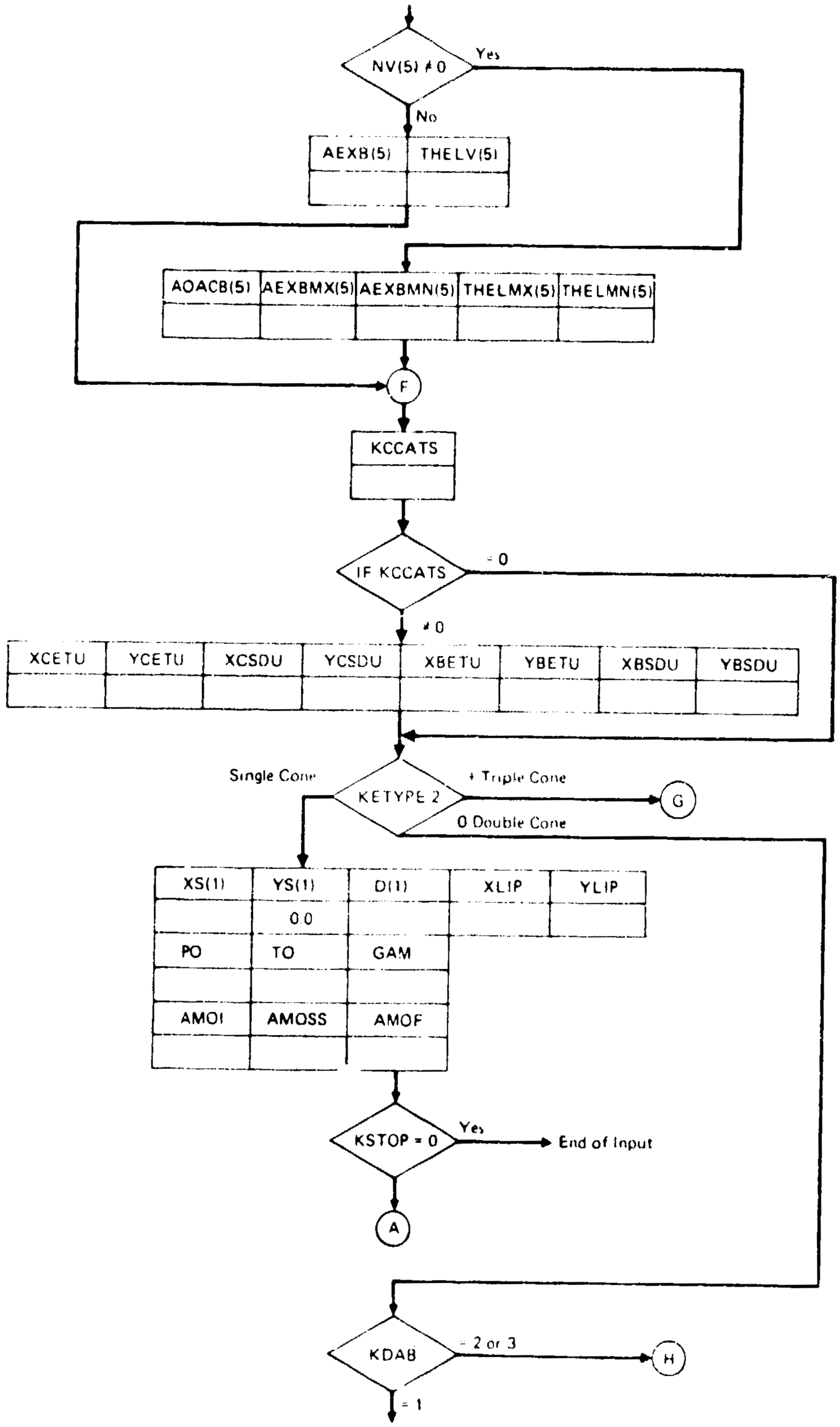


Figure 7. (Contd.) Program AXI Input Schematic.

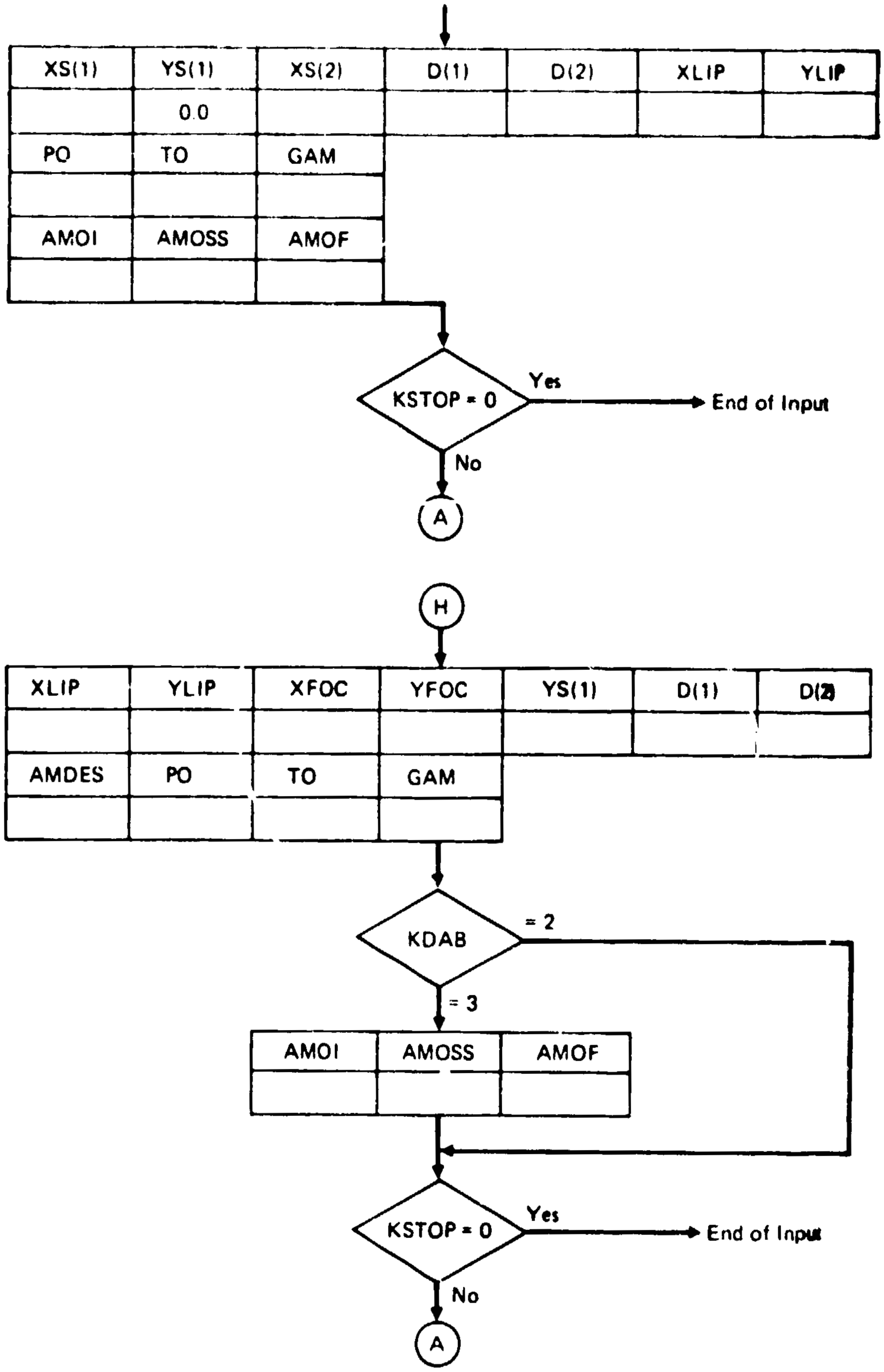


Figure 7. (Contd.) Program AXI Input Schematic.

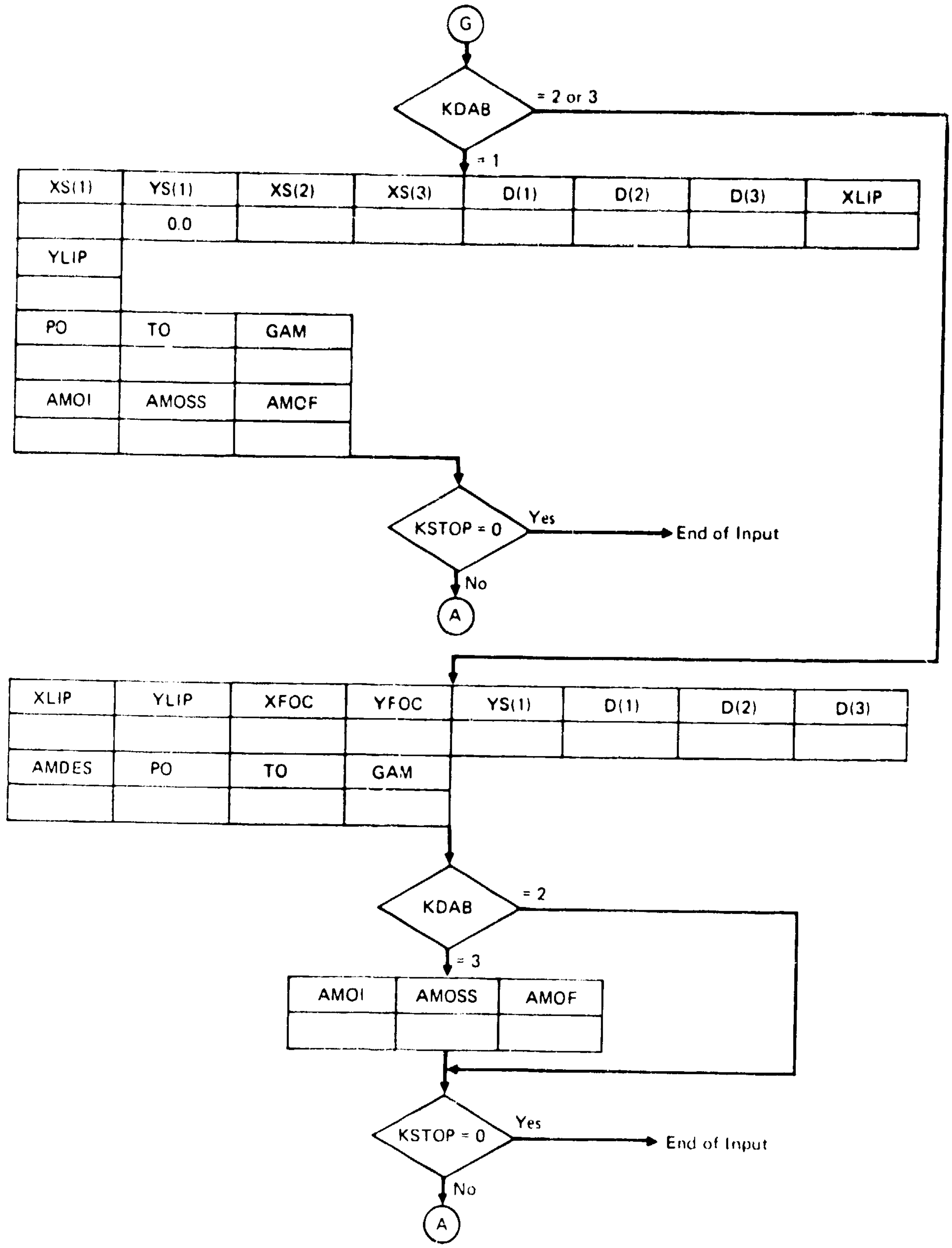


Figure 7. (Contd.) Program AXI Input Schematic.

3.2.4.3 ISENTROPIC SPIKE DESIGN INPUT VARIABLE DEFINITIONS (NAMELIST SPK00)

VARIABLE	DEFINITION
KANAT	Control on type of inlet configuration = 1 external compression surface only - no duct specified = 2 external comression surface followed by diverging duct = 3 external compression surface followed by converging-diverging duct
KDAB	Control on type of computation desired = 1 analysis of a given inlet geometry over a range of M_0 = 2 design of the eternal compression surface at a specified value of M_0 followed, if desired by analysis over a range of M_0
KSTØP	Control on query - Last case? = 0 yes ≠ 0 no
KCLWD	Control on query - Compute cowl lip and wave drag? = 0 no ≠ 0 yes
KBLD	Control on query - Estimate boundary layer diverter drag? = 0 no ≠ 0 yes
KNSM	Control on query - Terminal normal shock at throat or downstream of converging-diverging duct? = 0 at throat ≠ 0 downstream
KPOL	Control on query - Estimate supersonic diffuser and normal shock - boundary layer viscous losses for a C-D duct case? = 0 no ≠ 0 yes
KB(1)	Control on query - Bleed on isentropic compression surface? = 0 no ≠ 0 yes
KB(2)	Control on query - Bleed/Bypass at cowl lip plane? = 0 no ≠ 0 yes

VARIABLE	DEFINITION
KB(3)	Control on query - Bleed/Bypass at throat of C-D duct? = 0 no ≠ 0 yes
NCP	Number of coord points in the external cowl array, ≤ 25
DLIP	Cowl lip diameter
XEC, YEC	Array of coord points defining the external cowl, the array must begin at the cowl lip
XBSDE, RISDE	Coords of the innerbody at the end of the subsonic diffuser for a diverging duct (KANAT = 2) case
XCSDE, ROSDE	Coords of the inner cowl at the end of the subsonic diffuser for a diverging duct (KANAT = 2) case
NICP	Number of coord points in the internal cowl array, ≤ 25
XIC*, YIC	Array of coord points defining the internal cowl, the array must begin at the cowl lip and terminate at the duct throat
NIBP	Number of coord points in he innerbody array, ≤ 25
XIB*, YIB	Array of coord points defining the innerbody, the array must begin at the point at which a normal through the cowl lip strikes the innerbody and terminate at the duct throat
XBSDM, RISDM	Coords of the innerbody at the end of the subsonic diffuser for a C-D duct (KANAT = 3) case
XCSDM, ROSDM	Coords of the inner cowl at the end of the subsonic diffuser for a C-D duct (KANAT = 3) case
XBNSM, RINSM	Innerbody coords of terminal shock position if shock is located in the diverging portion of a C-D duct
XCNSM, RONSM	Inner cowl coords of terminal normal shock position if shock is located in the diverging portion of a C-D duct
BLDTR	Innerbody boundary layer displacement thickness at the terminal normal shock position in a C-D duct
BLMTR	As directly preceding for momentum thickness
BLDTC	Inner cowl boundary layer displacement thickness at the terminal normal shock position in a C-D duct

* It is necessary that XIC(NICP) = XIB(NIBP), for most cases they differ by a small increment only

VARIABLE	DEFINITION
BLMTC	As directly preceding for momentum thickness
DIVHT	Boundary layer diverter height (perpendicular to fuselage)
DIVWT	Boundary layer diverter width (parallel to fuselage)
DIVHA	Boundary layer diverter half angle - degrees
DIVDS	Fuselage boundary layer thickness at the boundary layer diverter station
AENB(i)	Entrance area for the i^{th} bleed
FLUSH(i)	Control on query - Does the i^{th} bleed have a flush or protruding exit? = 0.0 flush = 1.0 protruding
NV(i)	Control on query - For the i^{th} bleed do we wish to compute the bleed geometry given the mass flow or do we wish to compute the mass flow given the geometry? = 0 given geometry, compute the mass flow = 1 given mass flow, compute geometry
AEXB(i)	Exit area for the i^{th} bleed
THELV(i)	Exit angle for the i^{th} bleed - degrees
AEXBMX(i)	Maximum exit area for the i^{th} bleed
AEXBMN(i)	Minimum exit area for the i^{th} bleed
THELMX(i)	Maximum exit angle fo the i^{th} bleed - degrees
THELMN(i)	Minimum exit angle for the i^{th} bleed - degrees
AOACB(i)	Bleed i mass flow (free stream projection/AC)
KCCATS*	Control on query - Estimate the terminal normal shock - boundary layer viscous losses for an inlet operating with the normal sock train in a constant area throat section initiated at the cowl lip plane? = 0 no ≠ 0 yes - If ≠ 0 KDAB must equal KANAT = 1

* If this option is exercised the inlet geometry must be input in inches

VARIABLE	DEFINITION
XBETU, YBETU	Innerbody coords at the end of a constant area throat section initiated at the cowl lip plane
XCETU, YCETU	Inner cowl coords at the end of a constant area throat section initiated at the cowl lip plane
XBSDU, YBSDU	Innerbody coords at the end of the subsonic diffuser for an inlet with a constant area throat section initiated at the cowl lip plane
XCSDU, YCSDU	Inner cowl coords at the end of the subsonic diffuser for an inlet with a constant area throat section initiated at the cowl lip plane
XLIP, YLIP	Cowl lip coords
DY	Vertical distance for which leading edge shock properties are assumed constant (set equal to 0.012 x XLIP if input as 0.0)
DXMAX	Maximum allowable horizontal displacement between either o two adjacent shock points o a generating field point and its associated body point (set equal to 0.02 x XLIP if input as 0.0)
DYMAX	As directly preceding for vertical displacement
TOLD	For a shock-on-lip design case, tolerance within which the shock is assumed to have struck the cowl lip (set equal to 0.001 if input as 0.0)
NPR	Control on query - Print out points of characteristics mesh? = 0 no ≠ 0 yes
XMDES	Design Mach number
THETAS	Leading edge cone half angle (degrees)
GAMM	Gamma
DELISO	Desired amount of isentropic turning for a design case (degrees)
XFOC, YFOC	Wave focal point coords for a design case
NINP	Number of coord points defining the external compression surface isentropic contour (must be input equal to 23)
XIN, YIN	Array of coord points defining the external compression surface isentropic contour

VARIABLE	DEFINITION
XLE, YLE	Coords of the inlet leading edge (must be input as 0.0, 0.0)
SLE	Slope of the straight line defining the external compression surface forward of the isentropic contour
XE, YE	Coords of the point at which a normal through the cowl lip strikes the innerbody
SE	Slope of the straight line defining the external compression surface aft of the isentropic contour
NAMO	Number of free stream Mach numbers for which the inlet is to be analyzed - If a design case (KDAB = 2), the first free stream Mach number input must be equal to the design Mach number
EM1	Free stream Mach number
TZ	Free stream static temperature - degrees Rankine
PO	Free stream static pressure - F/L2, the L in this input variable must correspond to he units used to input the inlet geometry
THTO	Leading edge cone half angle (degrees)
GAM	Gamma

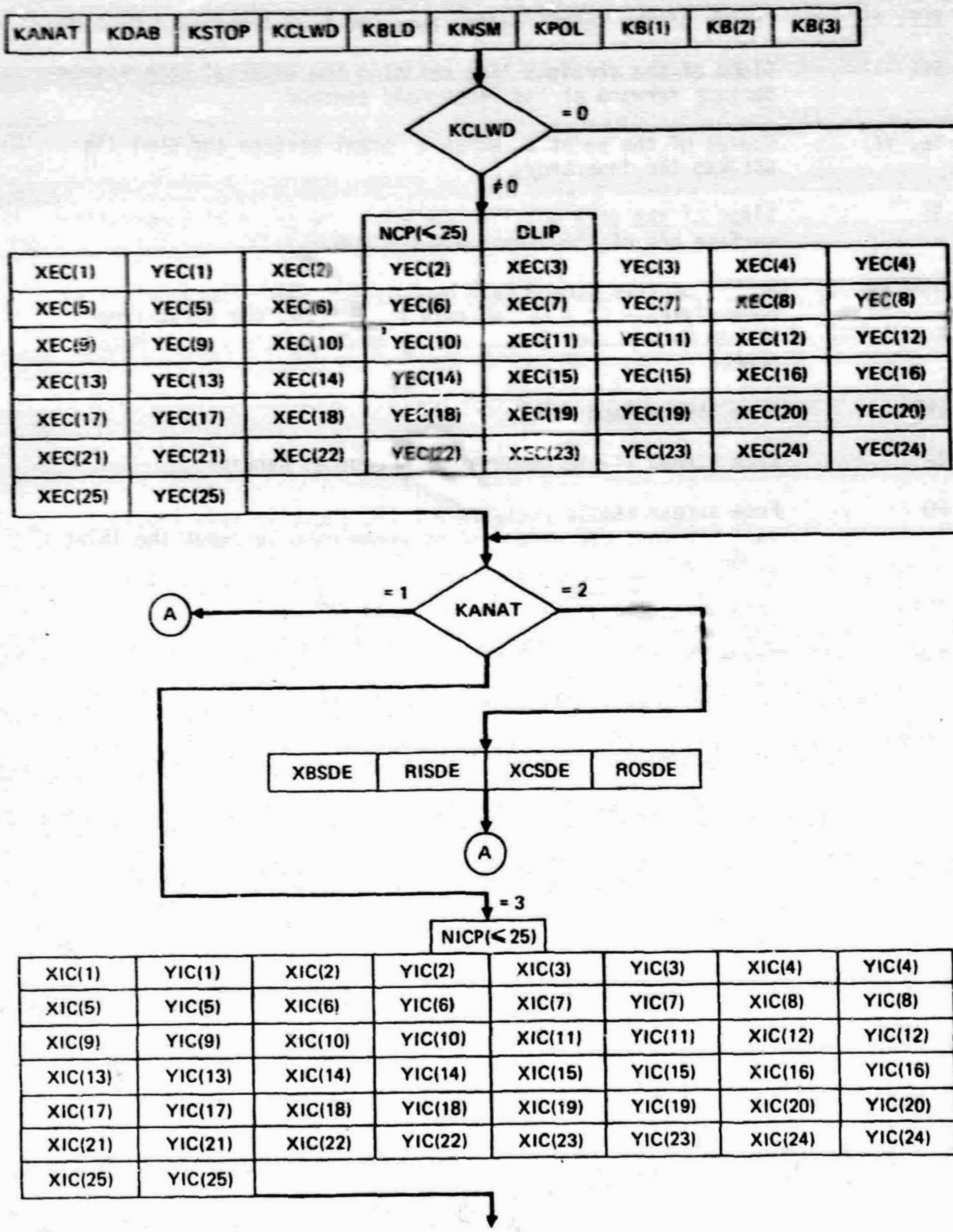


Figure 8. Program AXISPK Input Schematic.

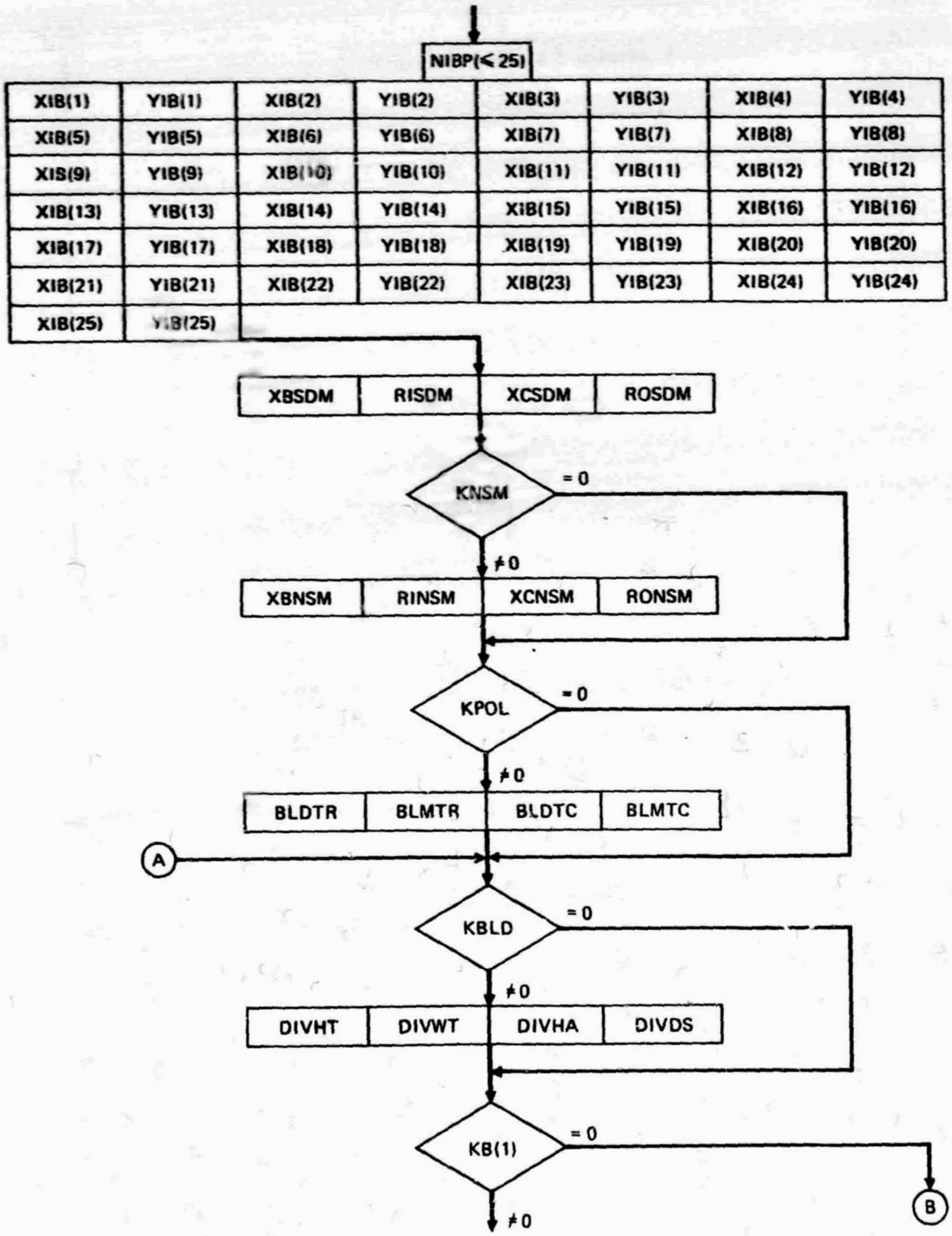


Figure 8. (Contd.) Program AXISPK Input Schematic.

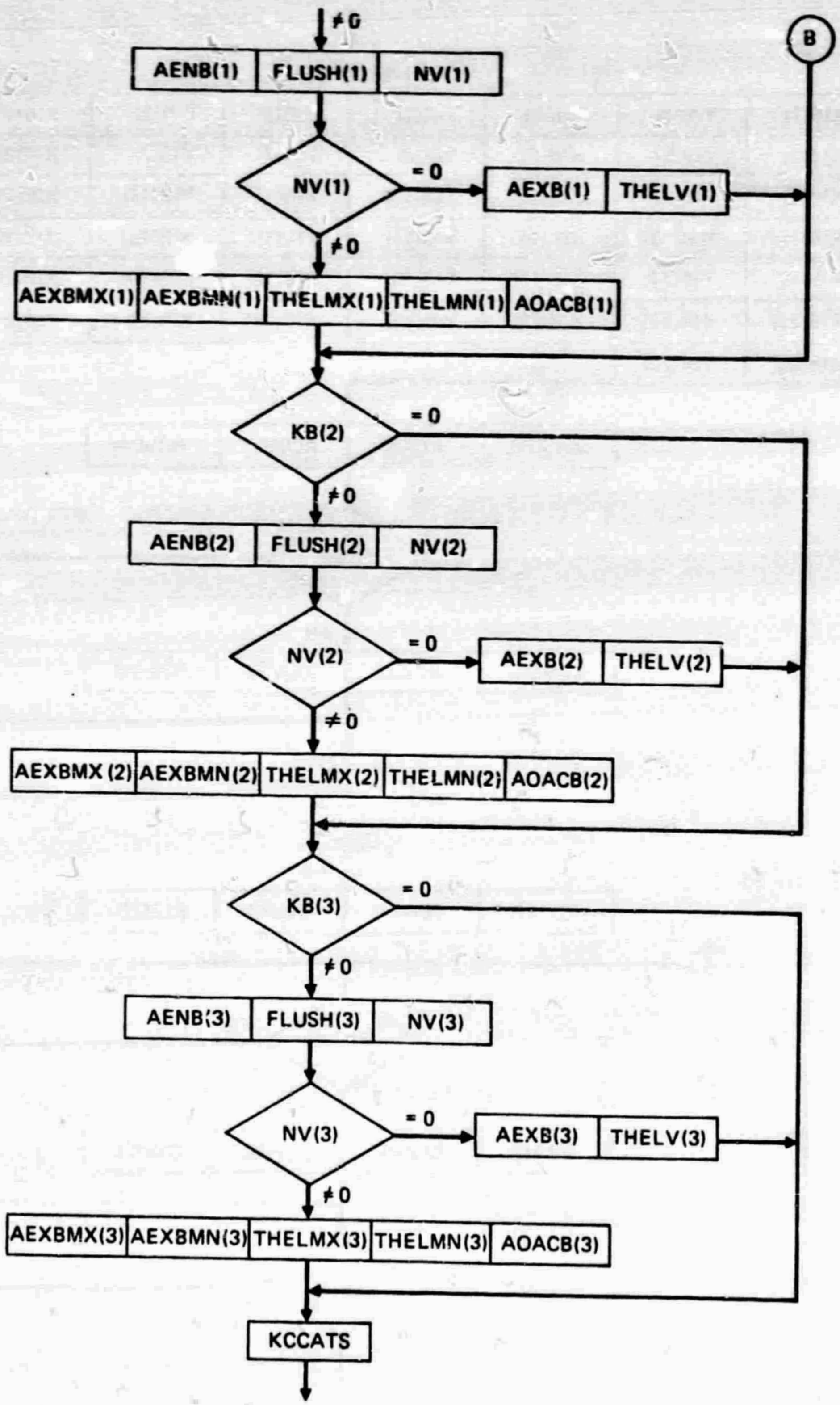
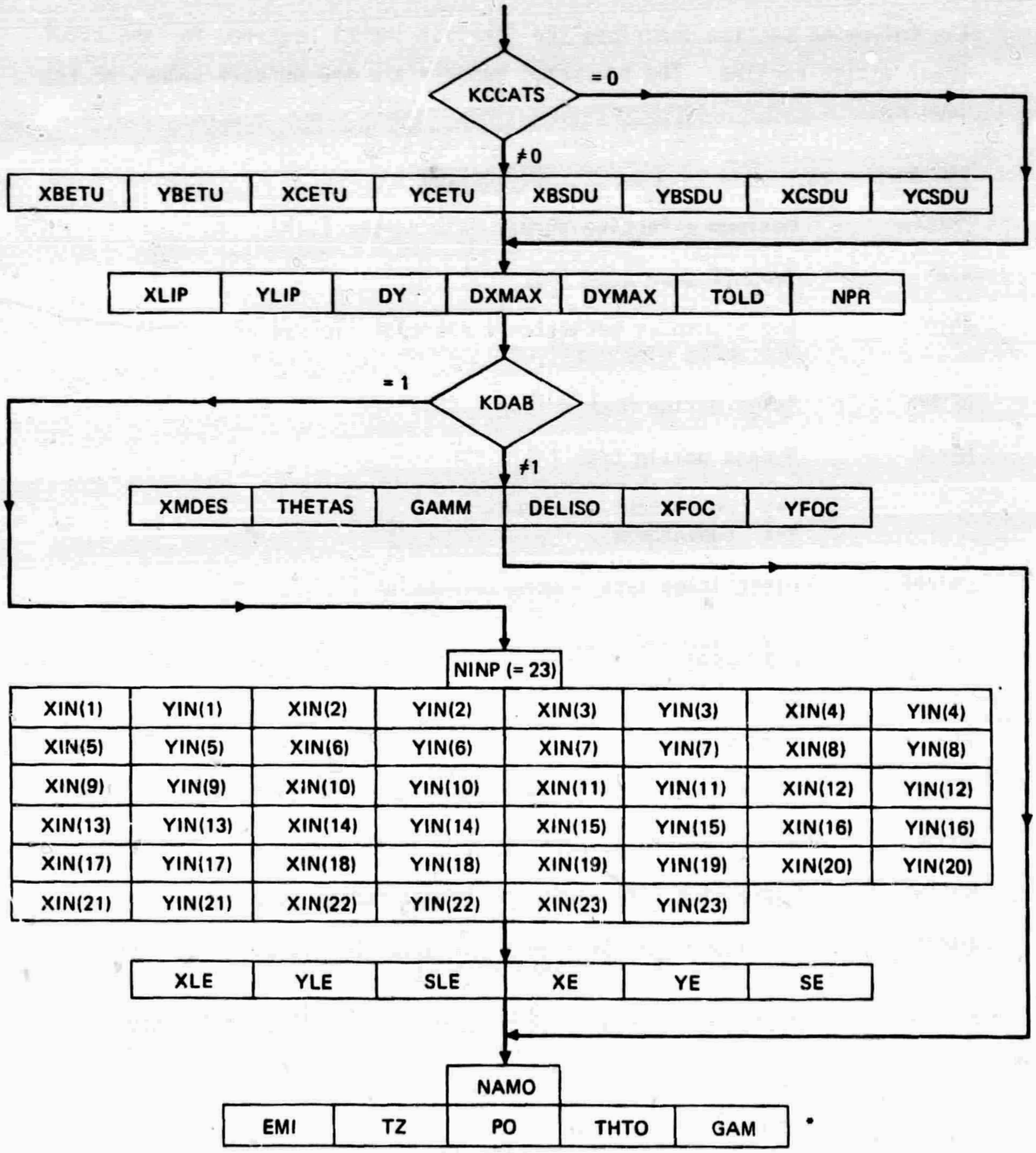


Figure 8. (Contd.) Program AXISPK Input Schematic.



*Repeat This Card for Each Mach Number Desired

Figure 8. (Contd.) Program AXISPK Input Schematic.

3.2.4.4 PITOT DESIGN INPUT VARIABLE DEFINITIONS (NAMELIST PITOT)

The following section describes the namelist inputs required for the pitot inlet design routine. The bracketed numbers are the default values of the inputs.

VARIABLE	DEFINITION
XMTEFM	Maximum effective throat Mach number (.75)
ATO	Takeoff door area (sq. ft.) (10.)
RBYD	Lip bluntness parameter - ratio of lip radius to inlet lip hydraulic diameter (.02)
DESMN	Inlet design Mach number (.85)
NTYPE	Bypass nozzle type (-1) =+1 convergent divergent =-1 convergent
INTYPE	Pitot inlet type - used for design (0) = 0 subsonic CTOL = 1 VSTOL = 2 transonic supersonic
WIDTH	Bypass door width (in) (10.)
HEIGHT	Bypass door height (in) (5.)
NDOOR	Number of bypass doors (5.)
RHITH	Ratio of hilite radius to throat radius (1.25)
RMMIT	Ratio of major axis to minor axis for elliptical contour between hilite and throat (2.5)
RMMITU	Ratio of major axis to minor axis for elliptical contour between hilite and throat (upper surface of VSTOL type inlet) (2.67)
RMMITL	Ratio of major axis to minor axis for elliptical contour between hilite and throat (lower surface of VSTOL type inlet) (1.85)

3.2.5 DERIVATIVE PROCEDURE INPUT SPECIFICATION (NAMELIST DER)

The Derivative Procedure can be used to perturb three basic types of maps; the inlet, afterbody, or CFG map. The parameters associated with each of these options are modified by utilizing a NAMELIST input with the name DER. Section 3.2.4.1 describes the inlet parameters, Section 3.2.4.2 describes the afterbody parameters, and Section 3.2.4.3 describes the CFG parameters.

3.2.5.1 INLET DERIVATIVE PARAMETERS

The inlet derivative parameters provide the basic information describing the configuration in terms of its important parameters. These data are used by the derivative option as a starting point from which a new configuration performance is derived.

VARIABLE	DEFINITION
DERIVN(1,1)	Aspect Ratio (2D)
DERIVN(2,1)	Sideplate Cutback (2D)
DERIVN(3,1)	First Ramp (cone) angle (deg)
DERIVN(4,1)	Mach Number
DERIVN(5,1)	Cowl Lip Bluntness
DERIVN(6,1)	Takeoff Door Area
DERIVN(7,1)	External Cowl Angle (deg)
DERIVN(8,1)	Exit Nozzle Type for Bleed
DERIVN(9,1)	Exit Nozzle Angle for Bleed (deg)
DERIVN(10,1)	Exit Flap Aspect Ratio for Bleed
DERIVN(11,1)	Exit Flap Area for Bleed
DERIVN(12,1)	Exit Nozzle Type for Bypass
DERIVN(13,1)	Exit Nozzle Angle for Bypass (deg)
DERIVN(14,1)	Exit Flap Aspect Ratio for Bypass
DERIVN(15,1)	Exit Flap Area for Bypass
DERIVN(16,1)	Subsonic Diffuser Area Ratio
DERIVN(17,1)	Subsonic Diffuser Total Wall Angle (deg)
DERIVN(18,1)	Subsonic Diffuser Loss Coefficient
DERIVN(19,1)	Throat to Capture Area Ratio (PITOT)

3.2.5.2 AFTBODY DERIVATIVE PARAMETER

The aftbody derivative parameters provide the basic information describing the configuration in terms of its important parameters. These data are used by the derivative program as a starting point from which a new configuration performance is derived.

VARIABLE	DEFINITION
DERIVN(1,2)	Nozzle Static Pressure Ratio
DERIVN(2,2)	Tail Fin Configurations (0., 1. or 2)
DERIVN(3,2)	Tail Fin Angle (deg)
DERIVN(4,2)	Tail Fin Fore-and-Aft Location Ratio
DERIVN(5,2)	Base Area Ratio

Aftbody Station Versus Area Curves

The area curves are used to calculate the IMS_T parameter which is the basic aftbody drag correlation parameters. There corresponds a nozzle aftbody area versus station curve for each value of A10/A9 in the nozzle aftbody drag table.

VARIABLE	DEFINITION
STATN(1,1)	X_1 location for aftbody area distribution 1
.	. . . .
.	. . . .
.	. . . .
STATN(N_1,1)	X_{N_1} location for aftbody area distribution 1
.	. . . .
.	. . . .
.	. . . .
STATN(1,N)	X_1 location for aftbody area distribution N
.	. . . .
.	. . . .
.	. . . .
STATN(N_N,N)	X_{N_N} location for aftbody area distribution N
AREAN(1,1)	Area at X_1 location for area distribution 1
.	. . . .
.	. . . .
.	. . . .
AREAN(N_1,1)	Area at X_{N_1} location for area distribution 1
.	. . . .
.	. . . .
.	. . . .
AREAN(1,N)	Area at X_1 location for area distribution N
.	. . . .
.	. . . .
.	. . . .
AREAN(N_N,N)	Area at N_{N_N} location for area distribution N
NSTATN(1)	Number of points in area distribution 1 table
.	. . . .
.	. . . .
NSTATN(N_N)	Number of points in area distribution N table

3.2.5.3 CFG DERIVATIVE PARAMETERS

The nozzle/aftbody derivative parametes provide the basic information describing the configuration in terms of its important parameters. These data are used by the derivative program as a starting point from which a new configuration performance is derived.

VARIABLE	DEFINITION
DERIVN(1,3)	Plug Half Angle (deg)
DERIVN(2,3)	Wedge Half Angle (deg)
DERIVN(3,3)	Aspect Ratio
DERIVN(4,3)	Divergence Half Angle (deg)

3.2.6 INLET AND NACELLE WEIGHT SPECIFICATION (NAMELIST INWT)

The following section describes the namelist inputs required for the inlet and nacelle weight routine. The bracketed numbers are the default values of the inputs.

VARIABLE	DEFINITION
SLST	Total sea level static thrust per engine (LB_F)
QMAX	Maximum airplane dynamic pressure (PSF)
	Inlet type (2)
INLET	= 1 2-D Mixed Compression = 2 2-D External Compression = 3 2-D Fixed Ramp = 4 Axisymmetric Fixed Center Body = 5 Axisymmetric External Compression Expandable Center Body = 6 Axisymmetric External Compression Translating Center Body = 7 Axisymmetric Mixed Compression Translating Spike = 8 Axisymmetric Mixed Compression Expandable Centerbody
LTOTAL	Length of inlet from most forward point on inlet to engine front face (ft) (body buried engine installation only)
NINLET	Number of engines per inlet (1.)
LDUCTS	Length of split inlet duct (0.)

VARIABLE	DEFINITION
BDOOR	Bypass door weight calculation option (0.) =0 No bypass door weight calculated =1 Bypass door weight calculated for a 2D mixed compressor inlet (INLET = 1) =2 Bypass door weight calculated for an axisymmetric mixed compression inlet with translating centerbody (INLET = 7)
TDOOR	Takeoff door weight calculation option (0.) =0 No takeoff door weight calculated =1 Takeoff door weight calculated for an axisymmetric mixed compression inlet with translating centerbody (INLET = 7)
KSHAPE	Shape correction factor for inlets other than 2-D or axisymmetric inlets applied to inlet weight prediction (1.)

3.2.7 NACELLE WETTED AREA CALCULATION (NAMELIST WET)

The following section describes the namelist inputs required by the nacelle wetted area calculation routine. The bracketed numbers are the default values of the inputs.

VARIABLE	DEFINITION
ITERFP(40)	Array of component numbers of those components in the secondary stream flow path
ISECFP(40)	Array of component numbers of those components in the primary stream flow path
ICCOMP	Component number of the component which defines the engines aft customer connect
IFCOMP	Component number of the fan nozzle
RLFDC	Ratio of the length from the inlet hilite to the maximum nacelle diameter to the maximum nacelle diameter. (.54)
CLMIN	Minimum allowable clearance between engine and cowl radius - inches (3.)

4.0 PROGRAM OUTPUT DESCRIPTION

In this section a description of variables which appear on the printed output is given.

4.1 NNEP

The following sections will describe the output of this engine performance code for each engine component.

4.1.1 'INLET' - JTYPE = 1

VARIABLE	DEFINITION
DATOUT(1)	-inlet drag from Table or computed
DATOUT(2)	-velocity - ft/sec
DATOUT(3)	-velocity - knots
DATOUT(4)	-ram temperature ratio
DATOUT(5)	-ram pressure ratio
DATOUT(6)	Mach number
DATOUT(7)	-inlet recovery -exit total pressure/ram pressure
DATOUT(8)	-exit temperature/518.67
DATOUT(9)	-altitude - feet

4.1.2 'DUCT' - JTYPE = 2

VARIABLE	DEFINITION
DATOUT(1)	-del P/P from momentum pressure drop (SPEC(2) or SPEC(7) was specified)
DATOUT(2)	-del P/P from DATINP(1) = SPEC(1)
DATOUT(3)	-pressure ratio at duct inlet used to compute inlet Mach number (Total/Static)
DATOUT(4)	-fuel flow/duct inlet weight flow
DATOUT(5)	-cross sectional area - in^2
DATOUT(6)	-fuel flow - lb/hr
DATOUT(7)	-inlet Mach number (if SPEC(2) or (7) was specified at the design point)
DATOUT(8)	-burner efficiency
DATOUT(9)	-burner outlet temperature (before bypass added)

4.1.3 'WINJ' - JTYPE = 3

VARIABLE	DEFINITION
DATOUT(1)	-actual water/air ratio
DATOUT(2)	-input value of fraction vaporized
DATOUT(3)	-saturation value of water/air
DATOUT(4)	-actual fraction vaporized
DATOUT(5)	-delta T
DATOUT(6)	-water flow rate in lbs/hr
DATOUT(7)	-pressure drop
DATOUT(8)	-BLANK
DATOUT(9)	-BLANK

4.1.4 'COMP' - JTYPE = 4

VARIABLE	DEFINITION
DATOUT(1)	-horsepower required (negative)
DATOUT(2)	-physical rpm
DATOUT(3)	-3rd. Dim. argument on compressor maps
DATOUT(4)	-R value used on maps
DATOUT(5)	-surge margin in percent
DATOUT(6)	-$N/\sqrt{\theta}$ used to read maps
DATOUT(7)	-scale factor on $W\sqrt{\theta}/\delta$
DATOUT(8)	-compressor efficiency
DATOUT(9)	-compressor pressure ratio

4.1.5 'TURB' - JTYPE = 5

VARIABLE	DEFINITION
DATOUT(1)	-horsepower produced by turbine (positive)
DATOUT(2)	-physical rpm
DATOUT(3)	-3rd dimension argument value on turbine maps
DATOUT(4)	-pressure ratio used in Table lookup
DATOUT(5)	-scale factor on $N/\sqrt{\theta}$
DATOUT(6)	—$N/\sqrt{\theta}$ used in Table lookup
DATOUT(7)	-scale factor on $W\sqrt{T}/P$
DATOUT(8)	-turbine efficiency
DATOUT(9)	-turbine overall pressure ratio

4.1.6 'HTEX' - JTYPE = 6

VARIABLE	DEFINITION
DATOUT(1)	-delta P/P main flow
DATOUT(2)	-delta P/P secondary flow
DATOUT(3)	-BLANK
DATOUT(4)	-effectiveness
DATOUT(5)	-scale factor on effectiveness
DATOUT(6)	-delta T calculated
DATOUT(7)	-delta T/ (T hot- T cold)
DATOUT(8)	-temperature rise difference ((guess value/calc'd)-1)
DATOUT(9)	BLANK

4.1.7 'SPLT' - JTYPE = 7

VARIABLE	DEFINITION
DATOUT(1)	-bypass ratio
DATOUT(2)	-delta P/P in the primary flow stream
DATOUT(3)	-delta P/P in the secondary flow stream
ALL REST BLANK	

4.1.8 'MIXER' - JTYPE = 8

VARIABLE	DEFINITION
DATOUT(1)	-main flow area in^2
DATOUT(2)	-secondary flow area - in^2
DATOUT(3)	-total to static pressure ratio at main flow inlet
DATOUT(4)	-total to static pressure ratio at secondary flow
DATOUT(5)	-velocity at main flow inlet
DATOUT(6)	-velocity at secondary fdlow inlet
DATOUT(7)	-exit mixed flow velocity
DATOUT(8)	-static pressure difference between streams
DATOUT(9)	-total mixed to average static pressure ratio inlet

4.1.9 'NOZZ' - JTYPE = 9

VARIABLE	DEFINITION
DATOUT(1)	-gross jet thrust -lb
DATOUT(2)	-actual jet velocity -ft/sec
DATOUT(3)	-total to static pressure ratio at throat
DATOUT(4)	-nozzle exit area in**w
DATOUT(5)	-nozzle throat area -in**2
DATOUT(6)	--Cd - flow coefficient
DATOUT(7)	-Cv - velocity coefficient
DATOUT(8)	-critical pressure ratio at throat
DATOUT(9)	-overall pressure ratio, inlet total to exit static

4.1.10 'LOAD' - JTYPE = 10

VARIABLE	DEFINITION
DATOUT(1)	-load horsepower (negative)
DATOUT(2)	-actual shaft rpm
DATOUT(3)	-propeller thrust **
ALL THE REST ARE BLANK	

**WARNING: When the flight velocity is zero, the equation for propeller thrust becomes indeterminate and the thrust is set to zero.

4.1.11 'SHFT' - JTYPE = 11

VARIABLE	DEFINITION
DATOUT(1)	-net shaft horsepower (required-delivered)
DATOUT(2)	-actual shaft rpm
DATOUT(3)	-actual shaft rpm of JM1
DATOUT(4)	-actual shaft rpm of JM2
DATOUT(5)	-actual shaft rpm of JP1
DATOUT(6)	-actual shaft rpm JP2
DATOUT(7)	-BLANK
DATOUT(8)	-net shaft horsepower/total horsepower
DATOUT(9)	-BLANK

4.2 WATE-2

The output from WATE-2 may be selected in any of three output formats. Either English or SI units can be selected. Examples of the output are shown for the short output in Figure 9, the long form, Figure 10, and the debug output, Figure 11. This output shows the mechanical design and weight breakdown within the individual component. The units in the output section are shown in Figure 12 for English and SI units. The type of units used are noted in the units section of the output.

A flow path layout is also available for conventional type engines. A typical layout is shown in Figure 13. The layout is scaled such that it will fit on one page of the output.

Total engine and accessory weights are displayed on the installation output in Figure 14.

4.3 INSTALLATION PROGRAM (INSTALL)

The installation program output is shown in Figure 14. The following describes that output.

VARIABLE	DEFINITION
FN	Net thrust outputed from NNEP based upon the user inputed inlet recovery and nozzle C_{F_G}
WFT	Fuel flow outputed from NNEP based upon the user inputed inlet recovery

```
TOTAL BARE ENGINE WEIGHT= 5466.  ACCESSORIES=   0.00  ESTIMATED TOTAL LENGTH=  125.
ESTIMATED CENTER OF GRAVITY= 41.  ESTIMATED MAXIMUM RADIUS=  39.
```

Figure 9   WATE-2 Short Form Output

WEIGHT INPUT DATA IN ENGL UNITS
WEIGHT OUTPUT DATA IN ENGL UNITS

COMP	WT	COMP	ACCU	UPSTREAM RADIUS				DOWNSTREAM RADIUS				
NO	EST	LEN	LEN	RI	RO	RI	RO	RI	RO	RI	RO	NSTAGE
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0
2	1559.	17.	17.	16.	39.	0.	0.	19.	38.	0.	0.	1
3	0.	0.	17.	0.	0.	0.	0.	19.	23.	23.	38.	0
4	817.	14.	32.	12.	17.	0.	0.	17.	17.	0.	0.	12
5	504.	19.	51.	15.	19.	0.	0.	15.	19.	0.	0.	0
6	256.	5.	56.	17.	18.	0.	0.	17.	19.	0.	0.	2
7	1469.	20.	77.	16.	18.	0.	0.	16.	20.	0.	0.	5
8	0.	0.	17.	23.	38.	0.	0.	23.	38.	0.	0.	0
9	0.	0.	77.	16.	20.	0.	0.	16.	20.	0.	0.	0
11	39.	0.	0.	12.	17.	15.	19.	0.	0.	0.	0.	0
12	211.	0.	0.	16.	39.	0.	0.	0.	0.	0.	0.	0
13	463.	48.	125.	0.	20.	0.	0.	0.	18.	0.	0.	0
14	149.	38.	55.	0.	38.	0.	0.	0.	36.	0.	0.	0

```
TOTAL BARE ENGINE WEIGHT= 5466.  ACCESSORIES=   0.00  ESTIMATED TOTAL LENGTH=  125.
ESTIMATED CENTER OF GRAVITY=   41.
ESTIMATED MAXIMUM RADIUS=  39.
```

Figure 10   WATE-2 Long Form Output

```
*************
*           *
*  FAN   2  *
*           *
************2

MAX CONDITIONS OCCUR AT
****************************************
      ALT         MN        VALUE
PTOT       0.     0.0         14.3 LB/SQIN
TTOT       0.     0.0        518.7 DEG R
CWIN  36000.      0.850     1116.5 LB/SEC
****************************************
DUCT
 M NO   VEL   T TOT   P TOT   P STAT   AREA     GAM
0.500  545.   519.    2053.   1730.    27.9480  1.4005

 UTIPMAX STRESS      DEN   W/AREA   TR      H/T
 1215.6 26135.0    0.168   4.986   1.800   0.400

 COMPRESSOR  2 MECHANICAL DESIGN

 LOADING    N STG    DIAM  U TIP C     RPM    C RPM   MAX RPM
   0.957     1.00    78.10  1157.1  3395.4   3395.4  3566.8

FRAME WT  =  468.14


STAGE     1
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
223.  393.  393.    0.   82.   11.7 0.168 0.168  4.70
  PR   DEL H  MACH  AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX   STAGE I
1.3990  14.7 0.500 27.948 15.62  39.05  73 1215.6 26135. 1090.  519.   519.   194937.

 N STG  WEIGHT  LENGTH  CENGRA  INERTIA
    1  1558.59   17.50    9.9  194937.1

DUCT
 M NO   VEL   T TOT   P TOT   P STAT   AREA     GAM
0.500  576.   580.    2874.   2423.    21.1190  1.3995

  PR     AD EF     PO      TO      HP
 1.4000  0.8500  2873.8   580.1  20858.
  HI       HO      WI      CWI
 123.95  138.70 1000.00 1030.93

****************** TOTAL COMP WEIGHT IS  1558.589

*************
*           *
*  HPC   4  *
*           *
************2

MAX CONDITIONS OCCUR AT
****************************************
      ALT         MN        VALUE
PTOT       0.     0.0         19.6 LB/SQIN
TTOT       0.     0.0        580.1 DEG R
CWIN       0.     0.0        113.5 LB/SEC
****************************************
DUCT
 M NO   VEL   T TOT   P TOT   P STAT   AREA     GAM
0.450  521.   580.    2816.   2451.     3.3286  1.3995

 UTIPMAX STRESS      DEN   W/AREA   TR      H/T
 1258.9 22391.1    0.168   0.930   1.200   0.700
```

Figure 11   WATE-2 Debug Output

```
COMPRESSOR  4 MECHANICAL DESIGN

 LOADING    N STG    DIAM   U TIP C     RPM    C RPM    MAX RPM
   0.647    12.00    34.59  1190.4   8340.6   7886.6   8340.6

STAGE     1
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 63.   14.   14.   36.    8.     2.4 0.168 0.168   5.00
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
1ST STAGE   PRATIO  IS 1.45 DES LIMIT IS 1.40
**STAGE ALLOWABLE PRESSURE RATIO IS TOO HIGH REDUCE INPUT             **
1.4457  17.2 0.450   3.329 12.11   17.30 125 1258.9 22391.  134.   580.    580.     6773.

STAGE     2

  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 63.    8.    8.   27.    6.     1.9 0.168 0.168   4.68
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.3913  17.2 0.437   2.495 13.59   17.30 164 1258.9 16815.   111.  652.    652.     7250.

STAGE     3
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 53.    5.    5.   22.    5.     1.5 0.168 0.168   4.36
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.3489  17.2 0.425   1.934 14.51   17.30 204 1258.9 13045.    91.  723.    723.     6749.

STAGE     4
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 43.    4.    4.   19.    4.     1.3 0.168 0.168   4.05
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.3148  17.2 0.412   1.540 15.12   17.30 242 1258.9 10395.    74.  794.    794.     5829.

STAGE     5
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 35.    3.    3.   16.    3.     1.1 0.168 0.168   3.73
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.2871  17.2 0.400   1.254 15.55   17.30 277 1258.9  8470.    61.  864.    864.     4936.

STAGE     6
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 29.    2.    2.   15.    3.     1.0 0.168 0.168   3.41
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.2639  17.2 0.387   1.041 15.86   17.30 308 1258.9  7034.    51.  934.    934.     4240.

STAGE     7
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 25.    2.    2.   14.    3.     0.9 0.168 0.168   3.09
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.93 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT                **
1.2443  17.2 0.375   0.879 16.09   17.30 334 1258.9  5938.    45. 1004.   1004.     3755.

STAGE     8
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 23.    1.    1.   13.    3.     0.9 0.168 0.168   2.77
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.94 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT                **
1.2275  17.2 0.362   0.752 16.27   17.30 351 1258.9  5084.    42. 1072.   1072.     3442.

STAGE     9
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 22.    1.    1.   13.    3.     0.8 0.168 0.168   2.45
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
```

Figure 11 (cont.) WATE-2 Debug Output

```
**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.95 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT                    **
1.2130  17.2 0.350  0.652 16.41  17.30 360 1258.9  4408.   39. 1141.  1141.      3261.

STAGE   10

  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 38.    2.    2.   13.    3.    0.8 0.286 0.286   2.14
  PR   DEL H  MACH  AREA  R HUB  R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.96 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT                    **
1.2004  17.2 0.337  0.572 16.52  17.30 359 1258.9  6581.   57. 1208.  1208.      5654.

STAGE   11
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 37.    2.    2.   13.    3.    0.9 0.286 0.286   1.82
  PR   DEL H  MACH  AREA  R HUB  R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.96 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT                    **
1.1892  17.2 0.325  0.507 16.61  17.30 346 1258.9  5830.   56. 1275.  1275.      5532.

STAGE   12
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 36.    2.    2.   14.    3.    1.0 0.286 0.286   1.50
  PR   DEL H  MACH  AREA  R HUB  R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.96 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT                    **
1.1793  17.2 0.312  0.453 16.69  17.30 320 1258.9  5213.   57. 1342.  1342.      5521.

 N STG  WEIGHT  LENGTH  CENGRA  INERTIA
   12   817.32   14.43    7.9   62942.0

DUCT
 M NO   VEL   T TOT    P TOT    P STAT   AREA     GAM
0.312  561. 1408.  50694.  47475.    0.3962  1.3555

  PR     AD EF     PO       TO       HP
18.0000  0.8600 50694.4  1408.1  41704.
  HI      HO      WI      CWI
 138.70  345.03  142.86  113.52

****************** TOTAL COMP WEIGHT IS   817.321

************
*          *
*  PBUR  5 *
*          *
***********2

MAX CONDITIONS OCCUR AT
***************************************
      ALT          MN        VALUE
PTOT       0.      0.0        352.0 LB/SQIN
TTOT       0.      0.0       1408.1 DEG R
CWIN  36000.      0.850        9.5 LB/SEC
***************************************
BURNER NUMBER      5
  RIN     ROUT      LENGTH      MACH      WSPEC
  15.236   18.636   19.200    0.044     3.715
  CAS WT   LIN WT   NOZ WT   INC WT    FRAME     WTOT
```

Figure 11 (cont.) WATE-2 Debug Output

```
     53.3     67.4     24.5     43.6    315.4    504.2


 ************
 *          *
 *  HPT   6 *
 *          *
 ***********2

 MAX CONDITIONS OCCUR AT
 *************************************
        ALT         MN        VALUE
 PTOT       0.      0.0         308.2 LB/SQIN
 TTOT       0.      0.0        2929.3 DEG R
 CWOUT      0.      0.0          53.7 LB/SEC
 *************************************
 DUCT
  M NO   VEL   T TOT   P TOT   P STAT   AREA     GAM
 0.500 1250. 2929.  44387.  37894.    0.4434   1.2878

  UTIPMAX STRESS     DEN   W/AREA    TR      H/T
  1278.6  5743.4    0.286   0.168   1.000    0.967

  TURBINE   6  MECHANICAL DESIGN
     H/T    N STG LOADING    AREA
   0.967   2.000   0.310   0.443
      UT     RTIP    RHUB   DEL H      RPM   MAXRPM  TORQ
  1278.6     17.6    17.0   210.7  8340.6  8340.6 313594.

 STAGE     1
  DISK   BLADE   VANE    HWD    CASE    AR
   17.6    2.5   10.1   62.3     6.5   1.00
   PR   DEL H  MACH   AREA   R HUB   R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
 1.8785 105.3 0.500   0.443 16.98   17.57 281 1278.6   5743.    99.07    2.06      3269.

 STAGE     2
  DISK   BLADE   VANE    HWD    CASE    AR
   29.9    6.1   24.4   87.2     9.3   1.20
   PR   DEL H  MACH   AREA   R HUB   R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
 2.0592 105.3 0.525   0.754 16.98   17.97 205 1307.7   9765.   157.00    2.89      6076.

  N STG   LENGTH   WEIGHT    CENGRA   INERTIA
    2      4.96   256.07      3.8      9345.

 DUCT
  M NO   VEL   T TOT   P TOT   P STAT   AREA     GAM
 0.550 1202. 2232.  11460.   9451.     1.3955   1.3035

   PR      TR      AD EF     PO       TO       TO.1
  3.8731  1.3137  0.9000 11460.3   2229.8   2232.0
  H IN    H OUT    AREA   FLOW      HP
  797.42  586.75    5.75  139.23   41501.

 ****************** TOTAL TURB WEIGHT IS   256.070


 ************
 *          *
 *  LPT   7 *
 *          *
 ***********2

 MAX CONDITIONS OCCUR AT
 *************************************
        ALT         MN        VALUE
 PTOT       0.      0.0          81.5 LB/SQIN
 TTOT       0.      0.0        2199.0 DEG R
 CWOUT  36000.      0.850       113.7 LB/SEC
 *************************************
```

Figure 11 (cont.) WATE-2 Debug Output

```
DUCT
M NO   VEL    T TOT    P TOT    P STAT   AREA     GAM
0.550 1193.  2199.   11733.    9675.      1.4045  1.3045

 UTIPMAX STRESS      DEN   W/AREA    TR       H/T
  561.7  3327.4    0.286   0.538    1.000    0.896

 TURBINE   7   MECHANICAL DESIGN
    H/T     N STG LOADING     AREA
  0.896    5.000    0.280    1.405
     UT     RTIP     RHUB    DEL H      RPM    MAXRPM  TORQ
  534.7     18.0     16.2    102.0   3395.4  3566.8 368594.

STAGE     1
 DISK    BLADE   VANE    HWD     CASE    AR
   8.8    16.7   66.9    90.3    10.7   2.00
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB MAXUTIP   STR    WEIGHT   LENGTH   STAGE I
1.1669  20.4 0.550   1.405 16.16  18.04 180   561.7  3327.   193.42     3.30     5539.

STAGE     2
 DISK    BLADE   VANE    HWD     CASE    AR
  10.0    19.1   76.3    90.4    10.9   2.25
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB MAXUTIP   STR    WEIGHT   LENGTH   STAGE I
1.1729  20.4 0.560   1.593 16.16  18.28 182   569.1  3773.   206.61     3.31     6318.

STAGE     3
 DISK    BLADE   VANE    HWD     CASE    AR
  11.4    22.3   89.3    91.9    11.2   2.50
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB MAXUTIP   STR    WEIGHT   LENGTH   STAGE I
1.1794  20.4 0.570   1.815 16.16  18.56 182   577.7  4299.   226.15     3.36     7361.

STAGE     4
 DISK    BLADE   VANE    HWD     CASE    AR
  13.0    26.7  106.7    94.8    11.8   2.75
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB MAXUTIP   STR    WEIGHT   LENGTH   STAGE I
1.1865  20.4 0.580   2.079 16.16  18.88 180   587.7  4924.   253.00     3.47     8735.

STAGE     5
 DISK    BLADE   VANE    HWD     CASE    AR
  15.0    32.2  129.0    99.1    12.5   3.00
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB MAXUTIP   STR    WEIGHT   LENGTH   STAGE I
1.1942  20.4 0.590   2.394 16.16  19.26 175   599.5  5672.   287.82     3.62    10486.

FRAME WT  =  301.69


 N STG   LENGTH  WEIGHT    CENGRA   INERTIA
   5      20.48 1468.69     12.8     38439.
DUCT
M NO   VEL    T TOT    P TOT    P STAT   AREA     GAM
0.600 1192.  1847.    5127.    4072.      2.7759  1.3171

  PR       TR      AD EF     PO        TO       TO.1
2.2884   1.1908   0.9000   5127.2   1846.7   1847.2
H IN     H OUT    AREA     FLOW      HP
577.05   475.08   19.52   144.59   20860.

****************** TOTAL TURB WEIGHT IS  1468.689


************
*          *
*  DUCT  9 *
*          *
***********2

MAX CONDITIONS OCCUR AT
**********************
        ALT          MN
PTOT       0.        0.0
TTOT       0.        0.0
**********************
```

Figure 11 (cont.) WATE-2 Debug Output

```
************
*          *
*  NOZ  13 *
*          *
***********2

MAX CONDITIONS OCCUR AT
**********************
       ALT          MN
PTOT        0.      0.0
TTOT        0.      0.0
**********************
NOZZLE   13
WEIGHT=    168.51 LENGTH=    48.087 TR WT=   294.34

************
*          *
*  DUCT  8 *
*          *
***********2

MAX CONDITIONS OCCUR AT
**********************
       ALT          MN
PTOT        0.      0.0
TTOT        0.      0.0
**********************

************
*          *
*  NOZ  14 *
*          *
***********2

MAX CONDITIONS OCCUR AT
**********************
       ALT          MN
PTOT        0.      0.0
TTOT        0.      0.0
**********************
NOZZLE   14
WEIGHT=    148.65 LENGTH=    37.526 TR WT=     0.0

************
*          *
*  SHAF 12 *
*          *
***********2

MAX TORQUE CONDITION
**********************
 TORQUE
 3.5
**********************
SHAFT  12
    DO       DI     LENG       DN      WT
  4.81     0.0     38.59     0.44  210.72

TOTAL INERTIA OF THIS SPOOL IS     38443.

************
*          *
*  SHAF 11 *
*          *
***********2
```

Figure 11 (cont.) WATE-2 Debug Output

```
MAX TORQUE CONDITION
***********************
 TORQUE
 5.2
***********************
SHAFT   11
   DO       DI    LENG      DN      WT
  5.98    5.21   19.20    1.27   38.84

TOTAL INERTIA OF THIS SPOOL IS     72290.

************
*          *
*  ACCS WT  *
*          *
************

  ACCS WT=    0.000
```

```
WEIGHT INPUT DATA IN ENGL UNITS
WEIGHT OUTPUT DATA IN ENGL UNITS
```

COMP NO	WT EST	COMP LEN	ACCU LEN	UPSTREAM RADIUS RI	RO	RI	RO	DOWNSTREAM RADIUS RI	RO	RI	RO	NSTAGE
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0
2	1559.	17.	17.	16.	39.	0.	0.	19.	38.	0.	0.	1
3	0.	0.	17.	0.	0.	0.	0.	19.	23.	23.	38.	0
4	817.	14.	32.	12.	17.	0.	0.	17.	17.	0.	0.	12
5	504.	19.	51.	15.	19.	0.	0.	15.	19.	0.	0.	0
6	256.	5.	56.	17.	18.	0.	0.	17.	19.	0.	0.	2
7	1469.	20.	77.	16.	18.	0.	0.	16.	20.	0.	0.	5
8	0.	0.	17.	23.	38.	0.	0.	23.	38.	0.	0.	0
9	0.	0.	77.	16.	20.	0.	0.	16.	20.	0.	0.	0
11	39.	0.	0.	12.	17.	15.	19.	0.	0.	0.	0.	0
12	211.	0.	0.	16.	39.	0.	0.	0.	0.	0.	0.	0
13	463.	48.	125.	0.	20.	0.	0.	0.	18.	0.	0.	0
14	149.	38.	55.	0.	38.	0.	0.	0.	36.	0.	0.	0

```
TOTAL BARE ENGINE WEIGHT= 5466.   ACCESSORIES=    0.00  ESTIMATED TOTAL LENGTH=  125.
ESTIMATED CENTER OF GRAVITY=   41.  ESTIMATED MAXIMUM RADIUS=  39.
```

Figure 11 (cont.) WATE-2 Debug Output

VARIABLE	SI UNITS	ENGLISH UNITS
Velocity	m/sec	ft/sec
Temperature	^oK	^oR
Pressure	n/m^2	lb/ft^2
Area	M^2	ft^2
Stress	N/cm^2	lb/in^2
Density	kg/cm^3	$.lb/in^3$
Weight	kg	lb
Length	cm	in
Enthalpy	kwatts	btu/sec
Horsepower	kwatts	hp
Weight flow	kg/sec	lb/sec
Weight flow/unit area	kg/m^2sec	lb/ft^2 sec
Radius	cm	in

Figure 12 WATE-2 Ouput Units

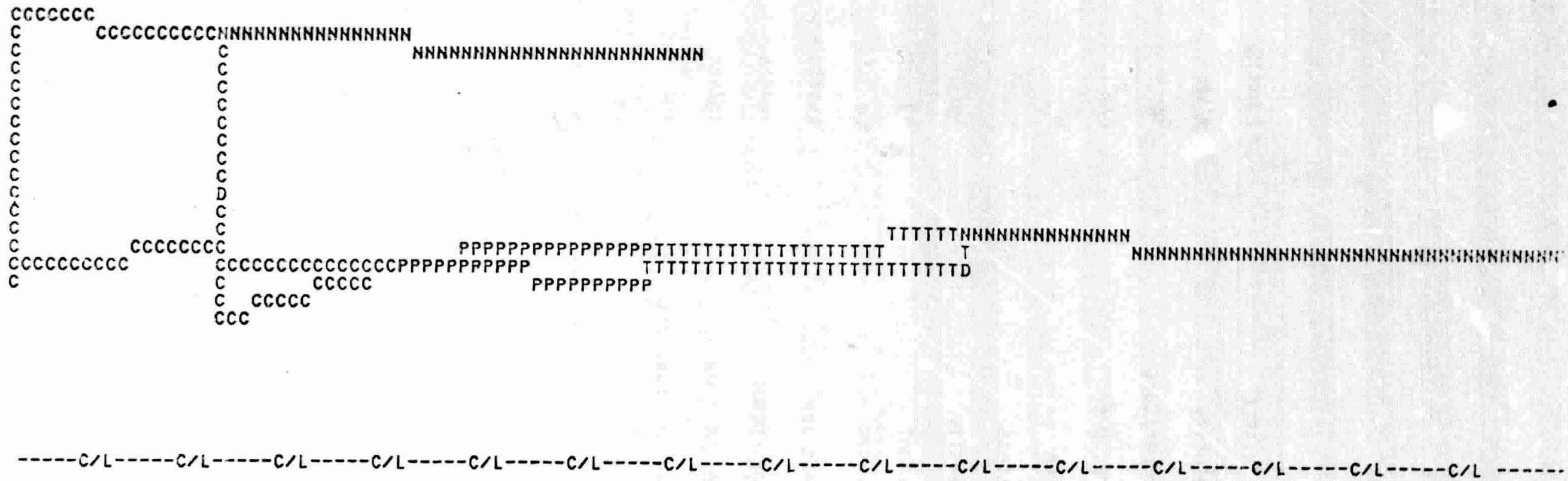


Figure 13   WATE-2 Engine Plot

```
             INLET MAP      NOZZLE MAP     DEL A/B MAP     CFG MAP                        DATE RUN
              TM1B3           DRP1                          CVRP                          20 NOV 79

                               ALTITUDE      MACH NUMBER

                               20000.0 FT        1.40

       AMBIENT              TOTAL              AMBIENT           TOTAL              DYNAMIC
       PRESSURE            PRESSURE          TEMPERATURE       TEMPERATURE          PRESSURE

   970.98 LBS/FT**2    3089.92 LBS/FT**2    447.37 DEG R      622.73 DEG R      1332.18 LBS/FT**2

        INLET CAPTURE          REFERENCE           REFERENCE AFTBODY        REFERENCE NOZZLE
          AREA (AC)       A10/A9 (A10/A9 R)     OR NACELLE AREA (A10R)      EXIT AREA (A9R)

          7.00 FT**2             1.40                 15.88 FT**2              11.34 FT**2

  ENGINE PERFORMANCE DATA
 INCORPORATING INLET RECOVERY    INLET MASS                                                            INSTALLED ENGINE
     AND NOZZLE CFG              FLOW RATIOS         INLET DRAG                AFTBODY DRAG            PERFORMANCE DATA

FN (LBF)              21705.715  AOSPL/AC 0.339  AC (FT**2)             7.000  A10/A9                2.089  FN (LBF)               20631.
WFT (LBM/HR)          37752.645  AOI/AC   0.661  CD SPL (TAB 3)         0.007  A10 (FT**2)          15.877  WFT (LBM/HR)           37752.
SFC (LBM/HR/LBF)          1.739  AOBLD/AC 0.017  CD SPL (TAB 3A)        0.083  A9 (FT**2)            7.601  SFC (LBM/HR/LBF)           1.
W2 COR (LBM/SEC)        204.992  AO/AC    0.644  CD BLD                 0.020  P9S/PAMB              1.000
W2 ABS (LBM/SEC)        264.859  AOBYP/AC 0.0    CD BYP                 0.0    CD A/B                0.082  FN COR (LBF)           44965.
                                 AOE/AC   0.645  CD INL TOT             0.110  DRAG A/B (LBF)     1738.791  WFT COR (LBM/HR)       88597.
RF                        0.975                  DRAG INL TOT (LBF) 1029.410   CD A/B SPR            0.0    SFC COR (LBM/HR/LBF)       1.
CFG (PRI)                 0.994                  CD INL REF             0.083  DRAG A/B SPR (LBF)    0.0
CGF (SEC)                 0.0                    DRAG INL REF (LBF)   773.999  CD A/B TOT            0.082
                                                 CD INL PS              0.027  DRAG A/B TOT (LBF) 1738.791
                                                 DRAG INL PS (LBF)    255.411  CD A/B REF            0.043
                                                                               DRAG A/B REF (LBF)  920.051
                                                                               CD A/B PS             0.039
REFERENCE INLET MASS FLOW RATIO = 0.0                                          DRAG A/B PS (LBF)   818.740

   BYPASS VS SPILLAGE
     OPTION NUMBER
          3.
  SCHEDULED BYPASS WITH
  EXCESS INLET AIRFLOW
        SPILLED
                                                  AIR INDUCTION SYSTEM
        NACELLE WEIGHT BREAKDOWN                   WEIGHT BREAKDOWN
                                                                               ENGINE WEIGHT BREAKDOWN
       NGINE MOUNTS (LBM) =    49.        INLET (LBM)           =   261.
       IREWALL (LBM)      =   138.        DUCT (LBM)            =     0.      BARE ENGINE (LBM) =   3210.
       OWL (LBM)          =   427.        BYPASS DOORS (LBM)    =     0.      ACCESSORIES (LBM) =      0.
       OTAL (LBM)         =   613.        T/O DOORS (LBM)       =     0.      TOTAL (LBM)       =   3210.
                                          TOTAL (LBM)           =   261.

                                              NACELLE DRAG BUILDUP

                                          SKIN FRICTION (LBF) =   569.9
                                          WAVE (LBF)          =  1266.9
                                          TOTAL (LBF)         =  1836.8
```

Figure 14.   INSTAL Output

VARIABLE	DEFINITION
SFC	WFT/FN
W2COR	Corrected airflow at the inlet exit
W2ABS	Absolute airflow at the inlet exit
RF	The recovery that the desired inlet must operate at in order to supply engine demand
CFG(PRI)	Primary stream gross thrust coefficient
CFG(SEC)	Secondary stream gross thrust coefficient
AOSPL/AC	Ratio of the free stream tube area of spilled air to the inlet capture area
AOI/AC	Ratio of the free stream tube area of the air entering the inlet to the inlet capture area
AOBLD/AC	Ratio of the free stream tube area of bleed air to the inlet capture area.
AO/AC	AOI/AC - AOBLD/AC
AOBYP/AC	Ratio of the free stream tube area of bypassed air to the inlet capture area.
AOE/AC	Ratio of the free stream tube area of engine demand air to the inlet capture area.
AC	inlet capture area
CD SPL(TAB 3)	Spillage drag coefficient
CD SPL(TAB 3A)	Reference spillage drag coefficient
CD BLD	Boundary layer bleed drag coefficient
CD BYP	Bypass drag coefficient
CD INL TOT	Total inlet drag coefficient CD BYP + CD BLD + CD SPL (TAB 3) Total inlet drag
DRAG INL TOT	Total inlet drag
CD INL REF	Reference inlet drag coefficient
DRAG INL REF	Reference inlet drag
CD INL PS	Throttle dependent inlet drag coefficient CD INL TOT - CD INL REF

VARIABLE	DEFINITION
DRAG INL PS	Throttle dependent inlet drag
A10	Maximum cross-sectional area (body buried engine installation only)
A9	Nozzle exit area
A10/A9	A10/A9
P9S/PAMB	Ratio of nozzle static pressure to ambient pressure
CD A/B	Aftbody drag coefficient
DRAG A/B	Aftbody drag
CD A/B SPR	Aftbody drag coefficient due to the under or over expansion of the nozzle
DRAG A/B SPR	Aftbody drag due to the under or over expansion of the nozzle
CD A/B TOT	Total aftbody drag coefficient CD A/B + CD A/B SPR
DRAG A/B TOT	Total aftbody drag
CD A/B REF	Reference aftbody drag coefficient
DRAG A/B REF	Reference aftbody drag
CD A/B PS	Throttle dependent aftbody drag coefficient CD A/B TOT - CD A/B REF
DRAG A/B PS	Throttle dependent drag
FN INST	Installed net thrust
WFT INST	Installed fuel flow
SFC INST	Installed specific fuel consumption
FN COR	Corrected installed net thrust - FN/δ
WFT COR	Corrected installed fuel flow - $WFT\sqrt{\theta}/\delta$
SFC COR	Corrected installed SFC - $SFC\sqrt{\theta}$

Whenever an inlet and/or nozzle/aftbody is selected from the library of maps it will be outputed.

4.4 DERIVATIVE PROCESSOR

The Derivative Processor outputs (Figure 15) a summary of the inlet's and/or nozzle/aftbody's baseline and altered derivative parameters. The effects of the altered derivative parameters on the inlet and/or nozzle/aftbody performance are reflected in the new performance maps.

4.5 INLET DESIGN AND ANALYSIS PROGRAMS

The following sections will describe the output from the NWC and Pitot, inlet design and analysis programs.

4.5.1 TDOO PROGRAM OUTPUT DEFINITIONS

VARIABLE*	DEFINITION
AOACB(i)	Bleed i^{th} mass flow
AOACC	Critical-supercritical mass flow
AOACM	Maximum mass flow (choke at throat) for cases in which an external compression surface shock is detached
AOACSC	Spilled mass flow attributable to sidewall contraction
AOACSS	Sidespill mass flow
ALPW	Angle of attack for the case in question
AMDES	Design Mach number
AMOW	Free stream Mach number for the case in question
ANGNS	Terminal normal shock angle for subcritical operation
ATHROT	inlet throat area
CDB(i)	Bleed i drag
CDBLD	Boundary layer diverter drag
CDLCL	Cowl lip drag

* All mass flows are expressed as their projection in the free stream divided by the =0 inlet projection (AC), and all drags are referenced to q_0AC

INLET MAP DERIVATIVE PARAMETERS

PARAMETER NUMBER	PARAMETER DEFINITION	OLD VALUE	NEW VALUE
1	ASPECT RATIO	1.0000	1.0000
2	SIDEPLATE CUTBACK	0.2000	0.2000
3	FIRST RAMP ANGLE(DEG)	7.3000	7.3000
4	DESIGN MACH NUMBER	2.0000	2.1000
5	COWL LIP BLUNTNESS	0.0120	0.0120
6	TAKEOFF DOOR AREA RATIO	20.0000	20.0000
7	EXTERNAL COWL ANGLE(DEG)	17.5000	17.5000
8	EXIT NOZZLE TYPE FOR BLEED(CN=0 CDN=1)	0.0	0.0
9	EXIT NOZZLE ANGLE FOR BLEED(DEG)	15.0000	15.0000
10	EXIT FLAP ASPECT RATIO FOR BLEED	2.0000	2.0000
11	EXIT FLAP AREA RATIO FOR BLEED	0.1000	0.1000
12	EXIT NOZZLE TYPE FOR BYPASS(CN=0 CDN=1)	0.0	0.0
13	EXIT NOZZLE ANGLE FOR BYPASS(DEG)	15.0000	15.0000
14	EXIT FLAP ASPECT RATIO FOR BYPASS	2.0000	2.0000
15	EXIT FLAP AREA RATIO FOR BYPASS	0.2000	0.2000
16	SUBSONIC DIFFUSER AREA RATIO	1.5000	1.5000
17	SUBSONIC DIFFUSER TOTAL WALL ANGLE(DEG)	10.0000	10.0000
18	SUBSONIC DIFFUSER LOSS COEFFICIENT	0.1200	0.1200

AFTERBODY MAP DERIVATIVE PARAMETERS

PARAMETER NUMBER	PARAMETER DEFINITION	OLD VALUE	NEW VALUE
1	NOZZLE STATIC PRESSURE RATIO	1.0000	1.0000
2	TAIL FIN CONFIGURATION	2.0000	2.0000
3	TAIL FIN ANGLE(DEG)	0.0	0.0
4	TAIL FIN FORE AND AFT LOCATION RATIO	0.2900	0.2900
5	BASE AREA RATIO	0.0	0.0

CFG MAP DERIVATIVE PARAMETERS

PARAMETER NUMBER	PARAMETER DEFINITION	OLD VALUE	NEW VALUE
1	DIVERGENCE HALF ANGLE(DEG)	11.4500	11.4500

Figure 15. Derivative Processor Output

VARIABLE	DEFINITION
CDSPL	Sideplate lip drag
CDSPW	Sideplate wave drag
CDSS	Drag attributable to sidespill mass flow
CDSWC	Drag attributable to sidewall contraction mass flow
CDWCL	Cowl wave drag
D(i)	Ramp i deflection at $\alpha = 0$
DEL1	Inlet leading edge deflection for an isentropic wedge design case
DEL3	Angle of vortex sheet generated by a same family shock-shock intercept referenced to local upstream veloctiy vector
DELISO	Total isentropic compression turning for an isentropic wedge design case
DFA	Flow angle at a duct position referenced to free stream velocity vector
DM	Mach number at a duct position
DP	Static pressure at a duct position
DP/PO	Local static pressure/free stream static pressure at a duct position
DPT	Total pressure at a duct position
DPT/PTO	Local total pressure/free stream total pressure at a duct position
DR(i)	Ramp i deflection referenced to free stream velocity vector
LEG	Duct wall which determines necessary structural thickness for given maximum deflection; LEG=1 implies sidewall limits, LEG=2 implies cowl limits

VARIABLE	DEFINITION
M	Mach number
NMAVG	Number of subcritical normal shock positions for which the recovery will be computed
NR	Duct flow field position indicator
NE	Duct flow field "lumped" expansion position indicator
NS	Duct flow field shock position indicator
NW	Duct flow field shock position indicator
P	Local static pressure
PO	Free stream static pressure
P/PO	Local static pressure/free stream static pressure
P/PZ	Local static pressure in a region downstream of a same family shock-shock intercept referenced to the local upstream static pressure
PT	Local total pressure
PTO	Free stream total pressure
PT21DC	Subsonic diffuser exit total pressure/subsonic diffuser entrance total pressure for critical operation
PT21SP	As directly preceding for supercritical operation
PT/PTO	Local total pressure/free stream total pressure
PT/PTZ	Local total pressure in a region downstream of a same family shock-shock intercept referenced to the local upstream total pressure
PTRNS	Total pressure ratio over supercritical terminal normal shock accounting for shock-boundary layer losses
QO	Free stream dynamic pressure
RECMD2	For supercritical operation, total pressure directly upstream of the terminal normal shock including supersonic diffuser viscous losses/local inviscid total pressure

VARIABLE	DEFINITION
STATION	Position indicator for necessary structural thickness computations; inlet is assumed to be operating critically and positions considered correspond to: o behind each external compression surface shock o cowl lip plane o duct throat o end of subsonic diffuser
T	Local static temperature
TO	Free stream static temperature
T3	Angle of coalesced shock generated by a same family shock-shock intercept referenced to local upstream velocity vector
TBEE	Body angle, referenced to free stream velocity vector, at the end of a "lumped" expanison in the duct; non-pertinent values are output at 0.0
TBES	As directly preceding for the origin of a "lumped" expansion
TBOE	As directly preceding for the end of a shock
TBOS	As directly preceding for the origin of a shock
TEX	Duct flow field "lumped" expansion angle referenced to local upstream velocity vector
TEXP	As directly preceding referenced to free stream velocity vector
THTW	External compression surface shock wave angle referenced to local upstream velocity vector
THTWP	As directly preceding referenced to free stream velocity vector
TSH	Duct flow field shock angle referenced to local upstream velocity vector
TSHP	As directly preceding referenced to free stream velocity vector
TTO	Free stream total temperature
T/TO	Local static temperature/free stream static temperature
TW	Angle of compensating (reflected) wave generated by a same family shock-shock intercept referenced to local upstream velocity vector

VARIABLE	DEFINITION
W	Inlet width
XCL, YCL	Cowl lip coords at =0
XCLR, YCLR	Cowl lip coords after inlet translation and rotation
XFOC, YFOC	Wave focal point for a design case
XNE, YNE XUP, YUP	Coords of the termination of a subcritical normal shock
XNS, YNS	Coords of the origin (surface) of a subcritical normal shock&*LW, YLW
XEE, YEE	Coords of the termination of a "lumped" expansion in the duct flow field
XES, YES	As directly preceding for the origin of a "lumped" expansion
XS(i), YS(i)	Coords of the origin of ramp i at α =0
XSR(i), YSR(i)	Coords of the origin of ramp i after translation and rotation
XSE, YSE	Coords of the termination of a shock in the duct flow field
XSS, YSS	As directly preceding for the origin of a shock
XSSI, YSSI	External compression surface shock-shock intercept point for a double ramp inlet
XSSI12, YSSI12	Intercept point of the 1 and 2 external compression surface shocks
XSSI23, YSSI23	As directly preceding for the 2 and 3 shocks
XSSI34, YSSI34	As directly preceding for the 3 and 4 shocks
YLE	Inlet leading edge ordinate for a design case

4.5.2 PROGRAM AXIOO OUTPUT DEFINITIONS

VARIABLE*	DEFINITION
AOACB(i)	Bleed i mass flow
AOACC	Critical-supercritical mass flow
AOACM	Maximum mass flow (choke at throat) for cases in which an external compression surface shock is detached
AMDES	Design Mach number
AMI	Inlet plane Mach number
AMO	Free stream mach number for the case in question
ATHROT	Inlet throat area
CDADD	Inlet additive drag at critical mass flow
CDB(i)	Bleed i drag
CDBLD	Boundary layer diverter drag
CDL	Cowl lip drag
CDWCL	Cowl wave drag
D(i)	Ramp i deflection at α =0
DA	Compression angle at cowl lip
DEL3	Angle of vortex sheet generated by a same family shock-shock intercept referenced to local upstream velocity vector
DFA	Flow angle at a duct position referenced to a free stream velocity vector
DM	Mach number at a duct position
DP	Static pressure at a duct position
DP/PO	Local static pressure/free stream static pressure at a duct position

* All mass flows are expressed as their projection in the freestream divided by the =0 inlet projection (AC), and all drags are referenced to q_0AC

VARIABLE	DEFINITION
DPT	Total pressure at a duct position
DPT/PTO	Local total pressure/free stream total pressure at a duct position
LOC REC	Total pressure ratio across cowl lip shock
M	Mach number
MACH	Mach number behind cowl lip shock
NR	Duct flow field position indicator
NE	Duct flow field "lumped" expansion position indicator
NS	Duct flow field shock position indicator
NW	Duct flow field shock poisiton indicator
P	Local static pressure
PAPO	Average static pressure ratio on conical section of cowl
PLOC/PTO	Ratio of local static to freestream total pressure
PO	Free stream static pressure
POPTO	Freestream static to total pressure ratio
P/PO	Local static pressure/free stream static pressure
P/PZ	Local static pressure in a region downstream of a same family shock-shock intercept referenced to the local upstream static pressure
PLPTL	Static to total pressure ratio of flow approaching cowl lip
PSRLOC	Static pressure ratio across cowl lip shock
PRT	Cumulative recovery on cowl surface (does not include effect of the local normal shock at the lip used in lip drag calculation).
PT	Local total pressure
PTLPTO	Total pressure ratio of flow approaching cowl lip

VARIABLE	Definition
PTO	Free stream total pressure
PTOQO	Freestream total to dynamic pressure ratio
PTPPTL	Total pressure ratio across normal shock at cowl lip
PTRSD	Subsonic diffuser exit total pressure/subsonic diffuser entrance total pressure for critical operation
PT21SP	As directly preceding for supercritical operation
PT/PTO	Local total pressure/free stream total pressure
PT/PTZ	Local total pressure in a region downstream of a same family shock-shock intercept referenced to the local upstream total pressure
PTRNS	Total pressure ratio over supercritical terminal normal shock accounting for shock-boundary layer losses
QO	Free stream dynamic pressure
RAY	The number of the ray in the first cone field
RECMD2	For supercruitical operation, total pressure directly upstream of the terminal normal shock including supersonic diffuser viscous losses/local inviscid total pressure
SFC ANGLE	Surface angle
T	Local static temperature
TO	Free stream static temperature
T3	Angle of coalesced shock generated by a same family shock-shock intercept referenced to local upstream velocity vector
TBEE	Body angle, referenced to free stream velocity vector, at the end of a "lumped" expansion in the duct; non-pertinent values are output as 0.0.
TBES	As directly preceding for the origin of a "lumped" expansion
TBOE	As directly preceding for the end of a shock
TBOS	As directly preceding for the origin of a shock

VARIABLE	DEFINITION
TEX	Duct flow field "lumped" expansion angle referenced to local upstream velocity vector
TEXP	As directly preceding referenced to free stream velocity vector
THAP	Flow angle approaching cowl lip
TSH	Duct flow field shock angle referenced to local upstream velocity vector
TSHP	As directly preceding referenced to free stream velocity vector
TSLOC	local shock angle at cowl lip
TTO	Free stream total temperature
T/TO	Local static temperature/free stream static temperature
TW	Angle of compensating (reflected) wave generated by a same family shock-shock intercept referenced to local upstream velocity vector
XCL, YCL	Cowl lip coords
X COORD, Y COORD	External cowl coordinates used in compuation
XFOC, YFOC	Wave focal point for a design case
XEE, YEE	Coords of the termination of a "lumped" expansion in the duct flow field
XES, YES	As directly preceding for the origin of a "lumped" exapnsion
XMAP	Cowl lip approach Mach number
XMFS	Free stream Mach number
XS(i) YS(i)	Coords of the origin of ramp i
XSE, YSE	Coords of the termination of a shock in the duct flow field
XSS, YSS	As directly preceding for the origin of a shock
XSSI, YSSI	External compression surface shock-shock intercept point for a double ramp inlet

4.5.3 PROGRAM SPKOO OUTPUT DEFINITIONS

VARIABLE*	DEFINITION
AOACB(i)	Bleed i mass flow
AOAC	Critical - supercritical mass flow
ATHROAT	Inlet throat area
B	Denotes a body point in the characteristics print
C1, C2, C3	Splyne curve fit coefficients
CD1	Drag coefficient on external surface segment
CD ADD	Additive drag coefficient
CDB(i)	Bleed i drag coefficient
CDBLD	Boundary layer diverter drag coefficient
CD EXT. SURFACE	External compression surface drag coefficient
CDL	Cowl lip drag coefficient
CDWCL	Cowl wave drag coefficient
DFA	Flow angle at a duct position referenced to free stream velocity vector
DM	Mach number at a duct position
DP	Static pressure at a duct position
DP/PO	Local static pressure/free stream static pressure at a duct position
DOOQO	Local static pressure minus free stream static pressure/free stream dynamic pressure
DPT	Total pressure at a duct position
DPT/PTO	Local total pressure/free stream total pressure at a duct position

* All mass flows are expressed as their projection in the free stream divided by the =0 inlet projection (AC), and all drags are referenced to q_0AC

VARIABLE	DEFINITION
ENTROPY	Entropy, referenced to free stream value of 0.0
EPSILON	Shock angle, degrees
FLOW1	Normalized mass flow from the wave flocal point to an arbitrary field point along a left characterisitc for a design case
G	Denotes a general or field point in the characteristics print
GA	Local ratio of specific heats
H	Enthalpy based on free stream static temperature
H2	Local enthalpy
HT1	Total enthalpy based on free stream conditions
I	Denotes an interpolated point in the characteristics print also used as number of a right characteristic
KP	Internal counter in design option routine
M	Local Mach number
	Free stream Mach number
MU	Local Mach angle
MV	Internal counter in design option routine
NL	As directly preceding
NNP	As directly preceding
NNR	As directly preceding
NPTS	Number of points defining the external compression surface
NR	Duct flow field position indicator
NW	Duct flow field shock position indicator
P	Local static pressure
P/PO	Local static pressure/free stream static pressure
P/PT	Local static pressure/local total pressure

VARIABLE	DEFINITION
PM ANGLE	Prandtl-Meyer angle, degrees
POQ	Local static pressure/free stream dynamic pressure
PT	Local total pressure
PT/PTO, PTP/PT, PTR	Local total pressure/free stream total pressure
PTRNS	Total pressure ratio over supercritical terminal normal shock accounting for shock-boundary layer losses
PT21DC	Subsonic diffuser exit total pressure/subsonic diffuser entrance total pressure for critical operation
PT21SP	As directly preceding for supercritical operation
PSR	Local static pressure/free stream static pressure
Q/PO	Local dynamic pressure/free stream static pressure
QOP	As directly preceding
RECMD2	For supercritical operation, total pressure directly upstream of the terminal normal shock including supersonic diffuser viscous losses/local inviscid total pressure
S	Denotes a shock in the characteristics print, also entropy
T	Local static temperature, degrees Rankine
T/TO	Local static temperature/free stream static temperature
TBOE	Body angle, referenced to free stream velocity vector, at the end of a shock in the duct; non-pertinent values are output on 0.0
TBOS	As directly preceding for the origin of a shock
TEMP	Static temperature, degrees Rankine
THT	Local flow angle, degrees
THTO	Deflection (degrees) through leading edge shock
THETA	Local flow angle, degrees

VARIABLE	DEFINITION
TSH	Duct flow field shock angle referenced to local upstream velocity vector
TSHP	As directly preceding referenced to free stream velocity vector
V/VMAX	Local velocity/maximum velocity
VEL	Velocity, ft/sec
VZ	Free stream velocity, ft/sec
W	Local veloctiy, ft/sec
X,Y	Cartesian coordinates
X(1,1), Y(1,1)	Inlet leading edge coordinates
XSE, YSE	Coordintes of the termination of a shock in the duct flow field
XSS, YSS	As directly preceding for the origin of a shock
YREF	Y coordinate used to compute reference area for drag coefficients

4.5.4 PITOT INLETS

The output from the pitot inlet design routine is shown in Figure 16. The inlet internal coordinates are shown from the inlet hilite to the engine face with the inlet throat being called out. The inlet external coordinates are shown from the inlet hilite to the maximum nacelle diameter. Also included in an inlet dimension summary are: hilite area, throat area, engine compressor hub to tip ratio, engine face area, length from the inlet hilite to the maximum nacelle diameter, subsonic diffuser length, lip contraction ratio, engine to throat area ratio and inlet wetted area.

The output from the pitot inlet analysis routine is shown in Figure 14; its description is found in Section 4.3

```
*****************************************************
*                                                   *
*             PITOT INLET COORDINATES               *
*                                                   *
*        X : DISTANCE FROM HILITE (INCHES)          *
* R : DITSANCE FROM THE ENGINE CENTERLINE (INCHES)  *
*                                                   *
*****************************************************
```

```
******************************
* INTERNAL INLET COORDINATES *
******************************
```

HILITE TO THROAT

	HILITE							THROAT
X :	0.0	0.412	1.030	2.059	4.118	8.236	14.414	20.591
R :	41.182	39.543	38.610	37.592	36.240	34.593	33.325	32.946

THROAT TO ENGINE FACE

	THROAT										ENGINE FACE
X :	20.591	22.905	25.213	28.656	32.062	35.417	38.711	40.867	42.991	44.930	46.496
R :	32.946	33.055	33.337	34.223	35.455	36.872	38.160	38.828	39.272	39.450	39.052

```
******************************
* EXTERNAL INLET COORDINATES *
******************************
```

HILITE TO MAX NACELLE DIAMETER

	HILITE							
X :	0.0	0.349	1.116	2.325	4.022	6.254	9.067	12.647
R :	41.182	41.369	41.556	41.743	41.930	42.117	42.304	42.491

								MAX NACELLE DIAMETER
X :	13.949	18.598	23.248	27.898	32.547	37.197	41.846	46.496
R :	42.549	42.719	42.842	42.934	42.996	43.028	43.044	43.052

```
****************************
* INLET DIMENSION SUMMERY *
****************************
```

HILITE AREA   THROAT AREA   HUB/TIP RATIO   ENGINE FACE AREA

Figure 16.   Pitot Inlet Design Output

5327.977 IN**2   3409.904 IN**2   0.400   4024.512 IN**2

OVERALL LENGTH (HILITE TO MAX NACELLE DIAMETER)	SUBSONIC DIFFUSER LENGTH
46.496 IN	25.905 IN
LIP CONTRACTION RATIO (HILITE TO THROAT)	AREA RATIO (ENGINE TO THROAT)
1.563	1.180

WETTED AREA

12496.109 IN**2

Figure 16. (cont.) Pitot Inlet Design Output

4.6 INLET AND NACELLE WEIGHT

A breakdown of inlet and nacelle weight is summarized on the installation output in Figure 14. Nacelle weight includes the following:

- o engine mounts
- o firewall
- o cowl

The air induction system weight includes the following:

- o inlet
- o duct
- o bypass doors (INLET = 1, 7 only)
- o takeoff doors (INLETY = 7 only)

4.7 NACELLE DRAG

A nacelle drag buildup is shown on the installation output in Figure 14. For subsonic flight conditions skin friction and form drag are displayed. For supersonic flight conditions skin friction and wave drag are displayed.

5.0 INPUT EXAMPLES

The succeeding sections will describe the inputs required to run the following installation methods:

- o engine performance and weight
- o database and analytical inlet performance
- o database nozzle performance
- o nacelle drag and weight
- o inlet weight
- o derivative procedure

5.1 SUBSONIC ENGINE APPLICATION

The following section shows the inputs necessary to install a subsonic engine utilizing a database inlet and an analytically determined inlet (TABLE VI through TABLE VII).

5.2 SUPERSONIC ENGINE APPLICATION

The following section shows the inputs necessary to install a supersonic engine utilizing database inlets and analytically determined inlets (TABLE VIII through TABLE XII).

5.3 DERIVATIVE PROCEDURE APPLICATION

The following section describes the input necessary to utilize the derivative procedure for changes in inlet, nozzle aftbody and nozzle C_{F_G} parameters (TABLE XIII through TABLE XVIII).

Table VI   Input Example - Subsonic Pitot Inlet (Database)

```
INSTAL & WATE-2 : TYPICAL SUBSONIC SEPERATE FLOW SHORT DUCTED TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
INST=0,IFLGRF=0,IWT=1,
&END
&D MODE=1,INST=0,IFLGRF=0,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=1000,4*0,.97,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,1.4,1
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=6.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
18,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,9)='DUCT',10,0,12,0,SPEC(1,8)=.04,
KONFIG(1,13)='NOZZ',12,0,13,0,SPEC(1,13)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,8)='DUCT',5,0,11,0,SPEC(1,8)=.02,
KONFIG(1,14)='NOZZ',11,0,14,0,SPEC(1,14)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'STAP',8,11,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=5000,MACH=.4,ETAR=.97,LABEL=T   &END
SUBSONIC INLET
&D ALTP=15000,MACH=.6,ETAR=.97  &END
CLIMB
&D SPEC(4,5)=2460,ALTP=36000,MACH=.85,ETAR=.97, &END
CRUISE
&D IWT=2,NVOPT=0,DEBUG=0   &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=0,ILENG(1)=2,3,4,5,6,7,9,13,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,9)='DUCT',1,4*0,
IWMEC(1,13)='NOZ ',1,-9,2,3*0,
IWMEC(1,8)='DUCT',1,4*0,
IWMEC(1,14)='NOZ ',1,-8,4*0,
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.5,1.7,.40,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.44,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
```

Table VI Input Example - Subsonic Pitot Inlet (Database) (continued)

```
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,9)=.50,0,0,-1,
DESVAL(1,13)=1.22,14*0.,
DESVAL(1,8)=.50,0,0,-1,
DESVAL(1,14)=.50,14*0.,
DESVAL(1,11)=50000.,.3,.85,4,6,
DESVAL(1,12)=50000.,.3,0,2,7,
&END
&D
IWT=0,INST=1,IFLGRF=0,ALTP=5000,MACH=.4,LABEL=F,
&END
&I
INMAP='M9SUB',NOZMAP=0,CFGMAP=0,DCDMAP=0,
DERP=0,ACI=37.,NWC=1,NWD=1,INLTWT=1,INOZ(1)=0,0,13,14,KVALUE=.00025,
ENGNO=1,TABRF=0.,ICFCN=2,
REFMFR=0.,OPTB=3.,A10A9R=2.1,SCALE=1.,
PRINT=1.,UNITI=1.,UNITO=1.,MODE=0,STOP=0,
&END
&WET
ITERFP(1)=1,2,3,8.14,0,
ISECFP(1)=1,2,3,4,5,6,7,9,13,0,
RLFDC=.54,ICCOMP=7,IFCOMP=14,CLMIN=4.,
&END
&INLWT
SLST=28500.,INLET=4,QMAX=300.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=.6
&END
&D
ALTP=36000,MACH=.85,SPEC(4,5)=2460
&END
&D
ENDIT=1
&END
```

Table VII Input Example - Subsonic Pitot Inlet (Analytical)

```
INSTAL & WATE-2 : TYPICAL SUBSONIC SEPERATE FLOW SHORT DUCTED TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
INST=0,IFLGRF=0,IWT=1,
&END
&D MODE=1,INST=0,IFLGRF=0,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=1000,4*0,.97,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,1.4,1
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=6.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
18,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,9)='DUCT',10,0,12,0,SPEC(1,8)=.04,
KONFIG(1,13)='NOZZ',12,0,13,0,SPEC(1,13)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,8)='DUCT',5,0,11,0,SPEC(1,8)=.02,
KONFIG(1,14)='NOZZ',11,0,14,0,SPEC(1,14)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'STAP',8,11,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=5000,MACH=.4,ETAR=.97,LABEL=T   &END
SUBSONIC INLET
&D ALTP=15000,MACH=.6,ETAR=.97  &END
CLIMB
&D SPEC(4,5)=2460,ALTP=36000,MACH=.85,ETAR=.97, &END
CRUISE
&D IWT=2,NVOPT=0,DEBUG=0   &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,9,13,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,'*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,9)='DUCT',1,4*0,
IWMEC(1,13)='NOZ ',1,-9,2,3*0,
IWMEC(1,8)='DUCT',1,4*0,
IWMEC(1,14)='NOZ ',1,-8,4*0,
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.5,1.7,.40,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.44,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80...020,0.,4,11*0.,
```

Table VII Input Example - Subsonic Pitot Inlet (Analytical) (continued)

```
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,9)=.50,0,0,-1,
DESVAL(1,13)=1.22,14*0.,
DESVAL(1,8)=.50,0,0,-1,
DESVAL(1,14)=.50,14*0.,
DESVAL(1,11)=50000.,.3,.85,4,6,
DESVAL(1,12)=50000.,.3,0,2,7,
&END
&D
IWT=0,ALTP=5000,MACH=.4,INST=1,IFLGRF=0,LABEL=F,
&END
&I
INMAP=0,NOZMAP=0,CFGMAP=0,DCDMAP=0,
DERP=0,ACI=37.,NWC=1,INLTWT=1,NWD=1,INOZ(1)=0,0,13,14,KVALUE=.00025,
ENGNO=1,ICFCN=2,
REFMFR=0.,A10A9R=2.1,SCALE=1.,
PRINT=1.,UNITI=1.,UNITO=1.,INLTYP=1,MODE=0,STOP=0.,
&END
&PITOT
XMTEFM=.75,ATO=10.,RBYD=.02,DESMN=.85,
NTYPE=-1,INTYPE=0,WIDTH=10.,HEIGHT=5.,XNDOOR=10.,
RHITH=1.25,HT=.4,RMMIT=2.5,
&END
&WET
ITERFP(1)=1,2,3,8,14,0,
ISECFP(1)=1,2,3,4,5,6,7,9,13,0,
RLFDC=.54,ICCOMP=7,IFCOMP=14,CLMIN=4.,
&END
&INLWT
SLST=28500.,INLET=4,QMAX=300.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=.6
&END
&D
ALTP=36000,MACH=.85,SPEC(4,5)=2460
&END
&D
ENDIT=1
&END
```

Table VIII Input Example - Supersonic Pitot Inlet (Database)

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table VIII Input Example - Supersonic Pitot Inlet (Database) (continued)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='NS2',NOZMAP='208NTTY',CFGMAP='CV1',DCDMAP=0,
DERP=0,ACI=4.2,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=4,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
ENDIT=1,
&END
```

Table IX Input Example - Two-Dimensional Inlet (Database)

```
INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table IX Input Example - Two-Dimensional Inlet (Database) (continued)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,158000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,AJMAX=0.,AJMIN=0.,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='FB',NOZMAP='ADENAB',CFGMAP='ADENCFG',DCDMAP=0,
DERP=0,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=1,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=1.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,AJMAX=0.,AJMIN=0.,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
ENDIT=1,
&END
```

Table X Input Example - Two-Dimensional Inlet (Analytical)

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,3000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table X Input Example - Two-Dimensional Inlet (Analytical) (continued)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,AJMAX=0.,AJMIN=0.,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP=0,NOZMAP='ADENAB',CFGMAP='ADENCFG',DCDMAP=0,
DERP=0,NWC=1,NWD=1,INLTWT=1,
INOZ(1)=10,0,0,0,KVALUE=.00025,
A10A9R=1.4,ENGNO=1.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&TD10 KETYPE=3,KANAT=3,KDAB=1,KSTOP=1,
KSWC=1,KCLR=1,KSPR=1,KCTH=3,KSTH=3,KFAL=0,
KYAW=0,KCLD=1,KCWD=1,KSLD=1,KSWD=1,KSSP=1,
KSP=2,KBLD=1,KNSM=1,KB=1,1,0,1,1,
SWANG=3.,CLRMD=2.2,RCHIN=7.0,SLRMD=2.7,
RWIN=7.0,SPANG=15.0,DEFLIM=.02,
XP1=0.,YP1=0.,XP2=20.,YP2=6.0,NECP=16,
XEC=21.49,22.0,22.5,23.0,23.5,24.0,24.5,25.0,
25.5,26.,26.5,27.,27.5,28.,28.5,29.,9*0.,
YEC=7.24,7.36,7.47,7.56,7.64,7.73,7.82,7.91,
7.99,8.07,8.12,8.17,8.20,8.20,8.20,8.20,9*0.,NICP=16,
XIC=21.49,22.0,22.5,23.,23.5,24.0,24.5,25.,
25.5,26.,26.5,27.,27.5,28.,28.5,29.1,9*0.,
YIC=7.24,7.33,7.42,7.50,7.58,7.65,7.72,7.79,
7.87,7.91,7.97,7.99,8.,8.,8.,8.,9*0.,NIBP=15,
XIB=22.2,22.5,23.,23.5,24.,24.5,25.,25.5,
26.,26.5,27.,27.5,28.,28.5,29.,10*0.,
YIB=5.64,5.75,5.92,6.08,6.21,6.34,6.46,6.56,
6.66,6.74,6.81,6.87,6.9,6.9,6.9,10*0.,
XBSDM=37.0,YBSDM=5.9,XCSDM=37.,YCSDM=8.,
BLDTR=.02,BLMTR=.01,BLDTC=.02,BLMTC=.01,
XBNSM=34.,YBNSM=6.44,XCNSM=34.,YCNSM=8.,
DIVHT=1.,DIVWT=10.,DIVHA=12.,DIVDS=1.2,
AENB=5.,5.,0.,2.,3.,
FLUSH=5*0.,NV=5*0,
THELV=40.,40.,0.,25.,60.,
AEXB=4.,4.,0.,1.5,2.0,
KCCATS=0, &END
&TD40
XS=0.,11.17,16.36,2*0.,
YS=0.,1.56984,3.05805,2*0.,
D=8.,16.,24.,2*0.,
```

Table X Input Example - Two-Dimensional Inlet (Analytical) (continued)

```
XCL=21.49,YCL=7.24,W=10.,
P0=10.,T0=500.,GAM=1.4,
AMOI=2.0,AMOSS=1.0,AMOF=5.0,
ALPI=-5.,ALPSS=5.,ALPF=5., &END
&D
SPEC(5,10)=5556,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=3,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,AJMAX=0.,AJMIN=0.,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
ENDIT=1,
&END
```

Table XI _ Input Example - Axisymmetric Inlet (Database)

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table XI Input Example - Axisymmetric Inlet (Database) (continued)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='TM1B3',NOZMAP='DRP1',CFGMAP='CVRP',DCDMAP=0,
DERP=0,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=5,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
ENDIT=1,
&END
```

Table XII - Input Example - Axisymmetric Inlet (Analytical)

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table XII Input Example - Axisymmetric Inlet (Analytical) (continued)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP=0,NOZMAP='DRP1',CFGMAP='CVRP',DCDMAP=0,
NWC=1,NWD=1,INLTWT=1,
INOZ(1)=10,0,0,0,KVALUE=.00025,
A10A9R=1.4,ENGNO=1.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&AXI10
KETYPE=3,KANAT=2,KDAB=3,KSTOP=0,
KCLWD=1,KBLD=1,KPOL=0,KNSM=0,KB=1,1,0,1,0,
NCP=5,
XEC=1.5024,1.604,1.7024,1.8024,1.9024,20*0.,
YEC=1.,1.05774,1.075,1.08,1.08,20*0.,
XSDE=3.5,RISDE=.05,ROSDE=.95,
DIVHT=.05,DIVWT=1.,DIVHA=10.,DIVDS=.075,
NV=0,1,3*0,
AENB=.05,.1,0.,.2,0.,
FLUSH=5*0.,
AEXB=.2,0.,0.,.5,0.,
THELV=15.,0.,0.,25.,0.,
AEXBMX=0.,.4,3*0.,
ADACB=0.,.01,3*0.,
AEXBMN=0.,.1,3*0.,
THELMX=0.,25.,3*0.,
THELMN=5*0.,KCCATS=0, &END
&AXI40
AMDI=2.,AMDSS=.5,AMOF=4.5,
D=15.,20.,25.,
PO=1.,TO=10.,GAM=1.4,
XLIP=1.5024,YLIP=1.0,YS=3*0.,XS=3*0., &END
&AXI41
XLIP=1.5024,YLIP=1.0,XFOC=1.5024,YFOC=1.0,YS=3*0.,
D=15.,20.,25.,
AMDES=3.,PO=1.,TO=10.,GAM=1.4, &END
DLIP=0.,
&D
SPEC(5,10)=5556,
&END
```

Table XII Input Example - Axisymmetric Inlet (Analytical) (continued)

```
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=4,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
ENDIT=1,
&END
```

Table XIII Input Example - Inlet Derivative Procedure Application: Design Mach Number

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BCAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table XIII Input Example - Inlet Derivative Procedure Application: Design Mach Number (continued)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='ATS2',NOZMAP='208NTTY',CFGMAP='CV1',DCDMAP=0,
DERP=1,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&DER
DERIVN(4,1)=2.1,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=9,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=2,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
ENDIT=1,
&END
```

Table XIV Input Example - Inlet Derivative Procedure Application : Cowl Lip Bluntness

```
INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table XIV Input Example - Inlet Derivative Procedure Application : Cowl Lip Bluntness. (cont.)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2.5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0 ,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='ATS2',NOZMAP='208NTTY',CFGMAP='CV1',DCDMAP=0,
DERP=1,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&DER
DERIVN(5,1)=.03,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=9,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=2,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
&D
ENDIT=1,
&END
```

Table XV Input Example - Nozzle/Aftbody Derivative Procedure Application : Tail Fin Fore and Aft Location Ratio

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table XV Input Example - Nozzle/Aftbody Derivative Procedure Application : Tail Fin Fore and Aft Location Ratio (continued)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,[illegible].,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,[illegible],6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,AJMAX=0.,AJMIN=0.,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='ATS2',NOZMAP='SING2D',CFGMAP='CV2D',DCDMAP=0,
DERP=1,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&DER
DERIVN(4,2)=.5,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=9,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=2,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,AJMAX=0.,AJMIN=0.,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
ENDIT=1,
&END
```

Table XVI Input Example - Nozzle/Aftbody Derivative Procedure Application : Cross-sectional Area vs. Station

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPL,=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table XVI Input Example - Nozzle/Aftbody Derivative Procedure Application : Cross-sectional Area vs. Station (continued)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1..0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,AJMAX=0.,AJMIN=0.,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='ATS2',NOZMAP='SING2D',CFGMAP='CV2D',DCDMAP=0,
DERP=1,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&DER
AREAN(1,8)=10.4,AREAN(2,8)=10.2,AREAN(3,8)=9.45,
AREAN(4,8)=8.3,AREAN(5,8)=1.04,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=9,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=2,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,AJMAX=0.,AJMIN=0.,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
ENDIT=1,
&END
```

Table XVII Input Example - Nozzle C_{F_G} Derivative Procedure Application : Plug Half Angle

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1,0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4.4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
```

Table XVII Input Example - Nozzle C_{F_G} Derivative Procedure Application : Plug Half Angle (cont)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
INT=0,INST=1,IFLGRF=0,AJMAX=0.,AJMIN=0.,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='ATS2',NOZMAP='DRP1',CFGMAP='CVRP',DCDMAP=0,
DERP=1,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&DER
DERIVN(1,3)=12.,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=9,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=2,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,AJMAX=0.,AJMIN=0.,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
ENDIT=1,
&END
```

Table XVIII Input Example - Nozzle C_{F_G} Derivative Procedure Application : Aspect Ratio

```
 INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW TURBOFAN
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',.,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1-2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0.
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
MIL SPEC INLET
&D ALTP=15000,MACH=1.0,ETAR=0 &END
TRANSONIC CLIMB - DRY
&D ALTP=20000,MACH=1.4,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
SET UP FOR AFTERBURNING
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
AFTERBURN
&D IWT=2,NVOPT=0,DEBUG=0 &END
NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NON ZERO
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-2,4*0,
```

Table XVIII Input Example - Nozzle C_{F_G} Derivative Procedure Application : Aspect Ratio (cont)

```
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
&D
IWT=0,INST=1,IFLGRF=0,AJMAX=0.,AJMIN=0.,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
&I
INMAP='ATS2',NOZMAP='SING2D',CFGMAP='CV2D',DCDMAP=0,
DERP=1,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
&D
SPEC(5,10)=5556,
&END
&DER
DERIVN(3,3)=2.,
&END
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=9,CLMIN=3.,
&END
&INLWT
SLST=16200.,INLET=2,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,AJMAX=0.,AJMIN=0.,
&END
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
&D
ENDIT=1,
&END
```

6.0 OVERALL PROGRAM FLOW

The present NNEP program essentially consists of a collection of 6 separate programs contained under one structure. These programs include:

a. The original NNEP program
b. WATE-2 program
c. Installation program
d. Derivative Procedure program
e. China Lake programs for 2 dimensional, axisymmetric and spike inlet
f. Pitot design program
g. Nacelle drag
h. Inlet and nacelle weight

See Figures 17 through 24 for their connectivity diagrams.

6.1 DERIVATIVE PROCEDURE PROGRAM LOGIC

This section presents the engineering flow charts used to develop the derivative procedure computer program:

- Inlet Derivative Procedure - Figures 25 through 31
- Nozzle/Afbody Derivative Procedure - Figure 32
- Nozzle/C_{F_G} Derivative Procedure - Figures 33 through 37

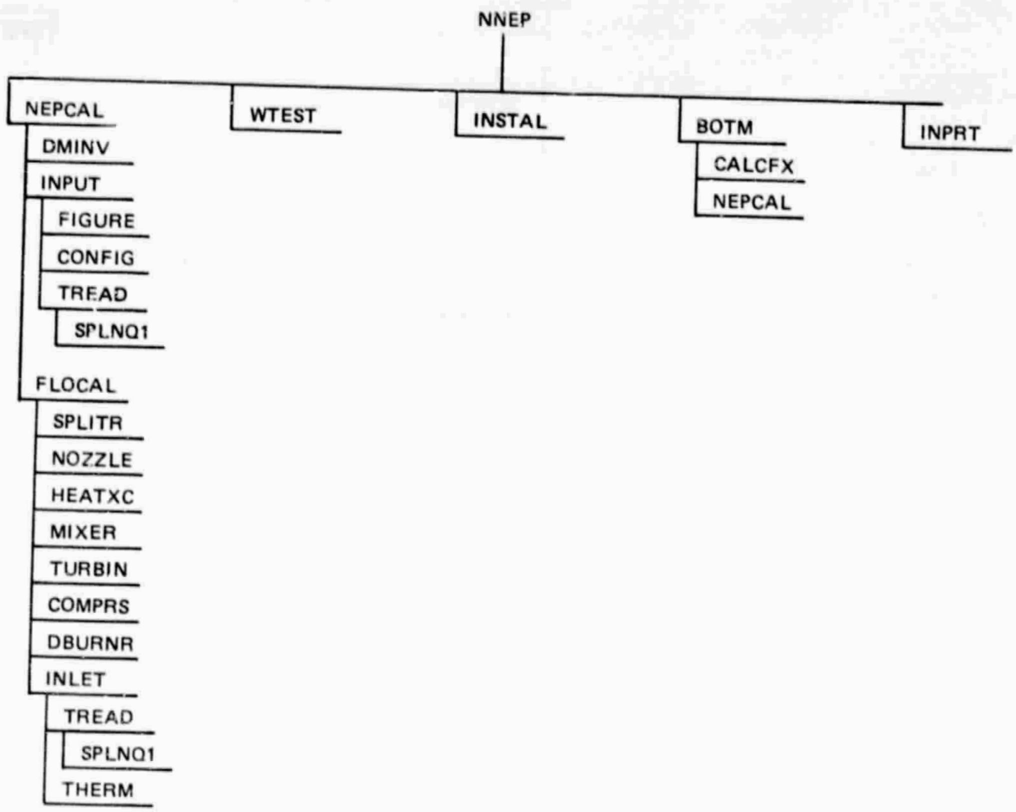


Figure 17 NNEP Connectivity Flow

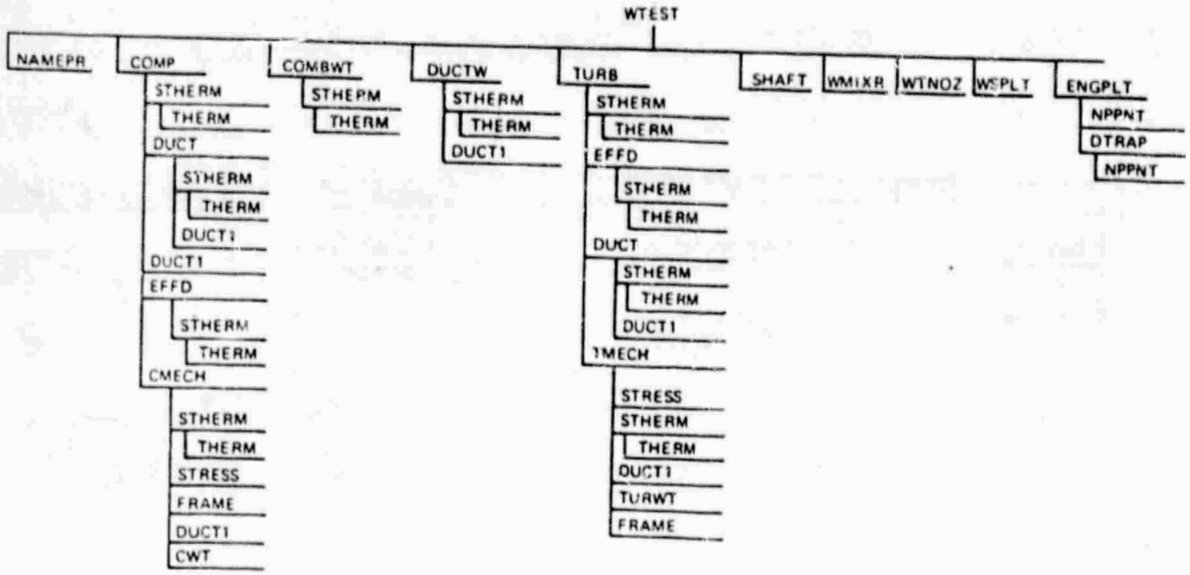


Figure 18   WATE2 Connectivity

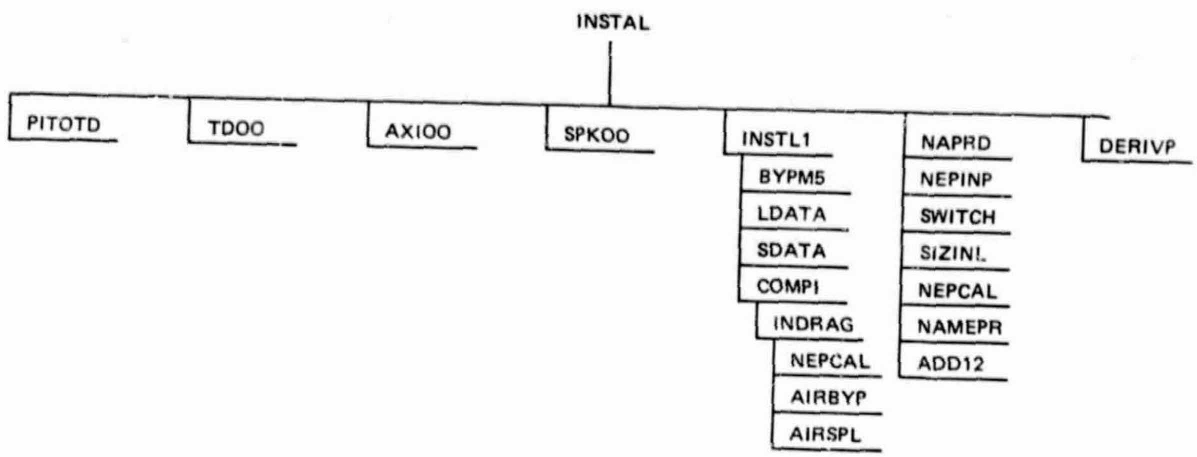


Figure 19 Installation Connectivity Diagram

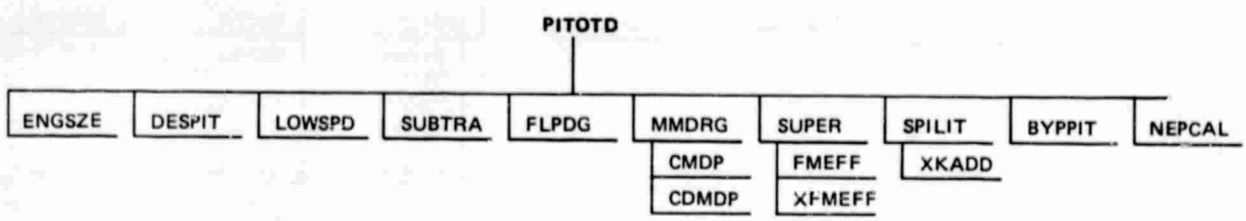


Figure 20 PITOT Connectivity Diagram

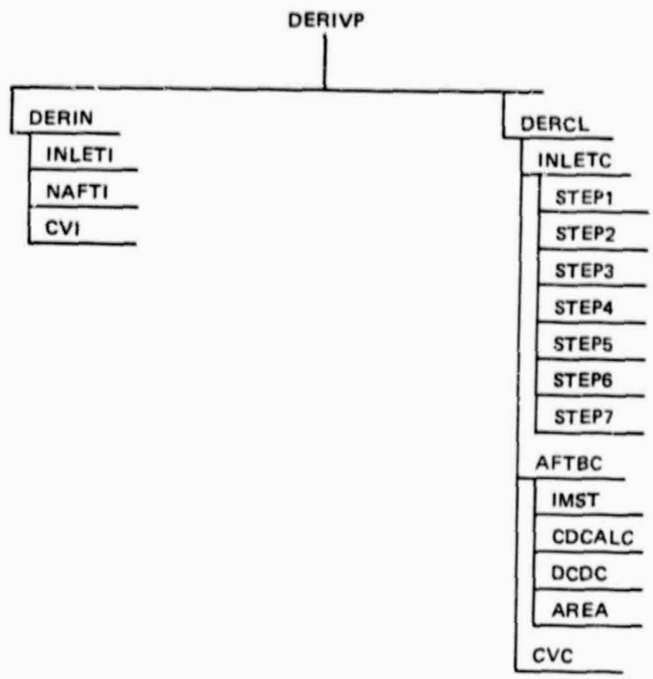
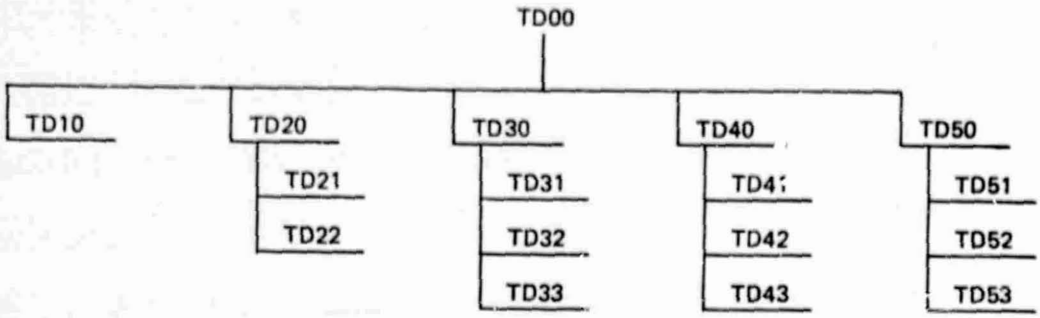
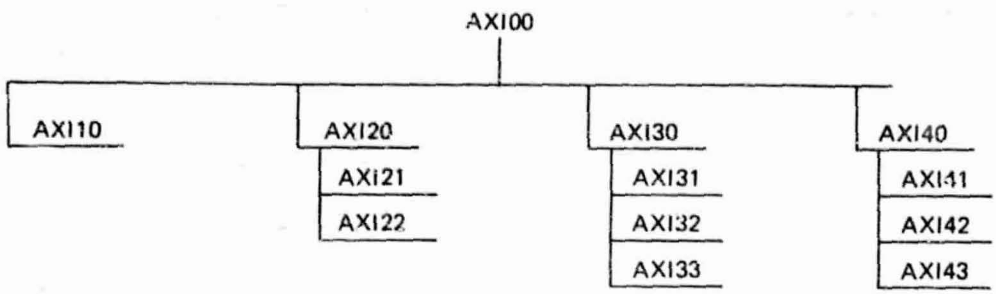


Figure 21 Derivative Procedure Connectivity Diagram



	Function
TD00	Controls transfers to Level 2 of structure
TD10	Takes in general input information
TD20	Sets up M_0 and α loops for single ramp cases, controls transfers to TD 21 and 22
TD21	Analyzes critical and subcritical operation of a single ramp inlet
TD22	Analyzes supercritical operation of a single ramp inlet which has an external compression surface followed by a converging-diverging duct.
TD30	Sets up M_0 and α loops for double ramp cases, controls transfers to TD 31, 32, and 33
TD31	Designs a double ramp external compression surface inlet and analyzes critical and subcritical operation of same
TD32	Analyzes critical and subcritical operation of a double ramp inlet
TD33	Analyzes supercritical operation of a double ramp inlet which has an external compression surface followed by a converging-diverging duct.
TD40	Sets up M_0 and α loops for triple ramp cases, controls transfers to TD 41, 42, and 43
TD41	Designs a triple ramp external compression surface inlet and analyzes critical and subcritical operation of same
TD42	Analyzes critical and subcritical operation of a triple ramp inlet
TD43	Analyzes supercritical operation of a triple ramp inlet which has an external compression surface followed by a converging-diverging duct.
TD50	Sets up M_0 and α loops for isentropic wedge (4 ramp) cases, controls transfers to TDs 51, 52, and 53
TD51	Designs an isentropic wedge external compression surface inlet, approximates this inlet as a 4 ramp inlet and analyzes critical and subcritical operation of same
TD52	Analyzes critical and subcritical operation of a 4 ramp inlet
TD53	Analyzes supercritical operation of a four ramp inlet which has an external compression surface followed by a converging-diverging duct.

Figure 22 Two-Dimensional Design Program Connectivity Diagram



Function

AXI00 Controls transfers to Level 2 of structure

AXI10 Takes in general input information

AXI20 Sets up M_0 loops for single cone cases, controls transfers to AXIs 21 and 22

AXI21 Analyzes critical operation of single cone inlet

AXI22 Analyzes supercritical operation of a single cone inlet which has an external compression surface followed by a converging-diverging duct.

AXI30 Sets up M_0 loops for double cone cases, controls transfers to AXIs 31, 32, and 33

AXI31 Designs a double cone external compression surface inlet and analyzes critical operation of same

AXI32 Analyzes critical operation of a double cone inlet

AXI33 Analyzes supercritical operation of a double cone inlet which has an external compression surface followed by a converging-diverging duct.

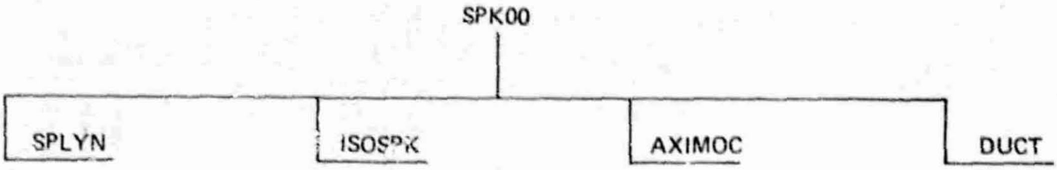
AXI40 Set up M_0 loops for triple cone cases, controls transfers to AXIs 41, 42, and 43

AXI41 Designs a triple cone external compression surface inlet and analyzes critical operation of same

AXI42 Analyzes critical operation of a triple cone inlet

AXI43 Analyzes supercritical operation of a triple cone inlet which has an external compression surface followed by a converging-diverging duct.

Figure 23 Axisymmetric Design Subroutine Connectivity Structure



	Function
SPK00	Takes in general input information, controls transfers to Level 2 of **structure**
SPLYN	Takes the coordinate arrays defining the external compression surface and fits them to a curve fit
ISOSPK	Uses conical flow theory and method of characteristics computations to design an isentropic spike contour given focal point, free stream Mach number and flow deflections
AXIMOC	Uses method of characteristics computations to determine the flow field adjacent to the external compression surface of an axisymmetric spike inlet and analyzes critical operation of same
DUCT	Analyzes supercritical operation of a axisymmetric spike inlet which has an external compression surface followed by a converging-diverging duct.

Figure 24 Axisymmetric Spike Design Connectivity Structure

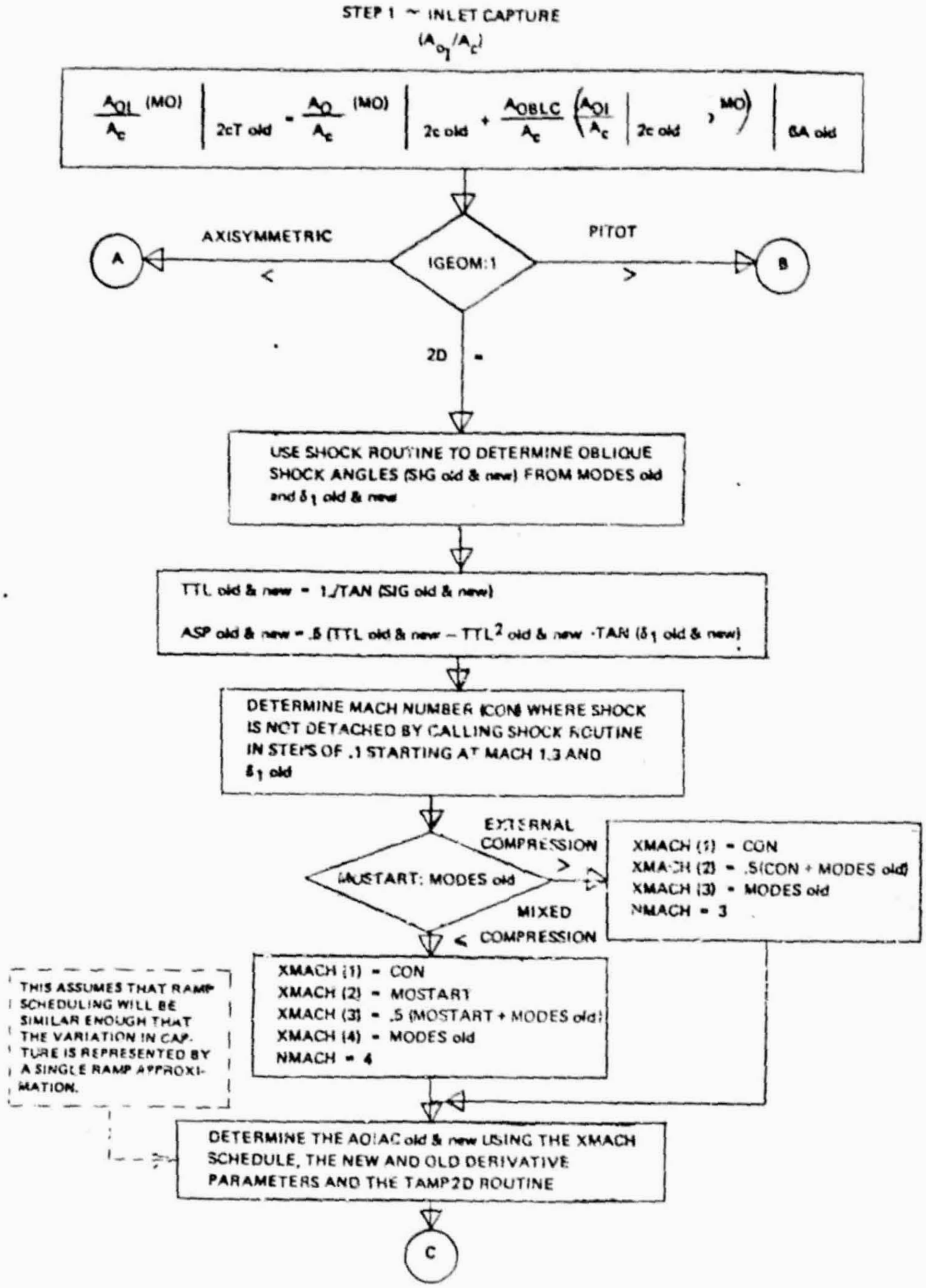


Figure 25. Flow Chart for Step 1

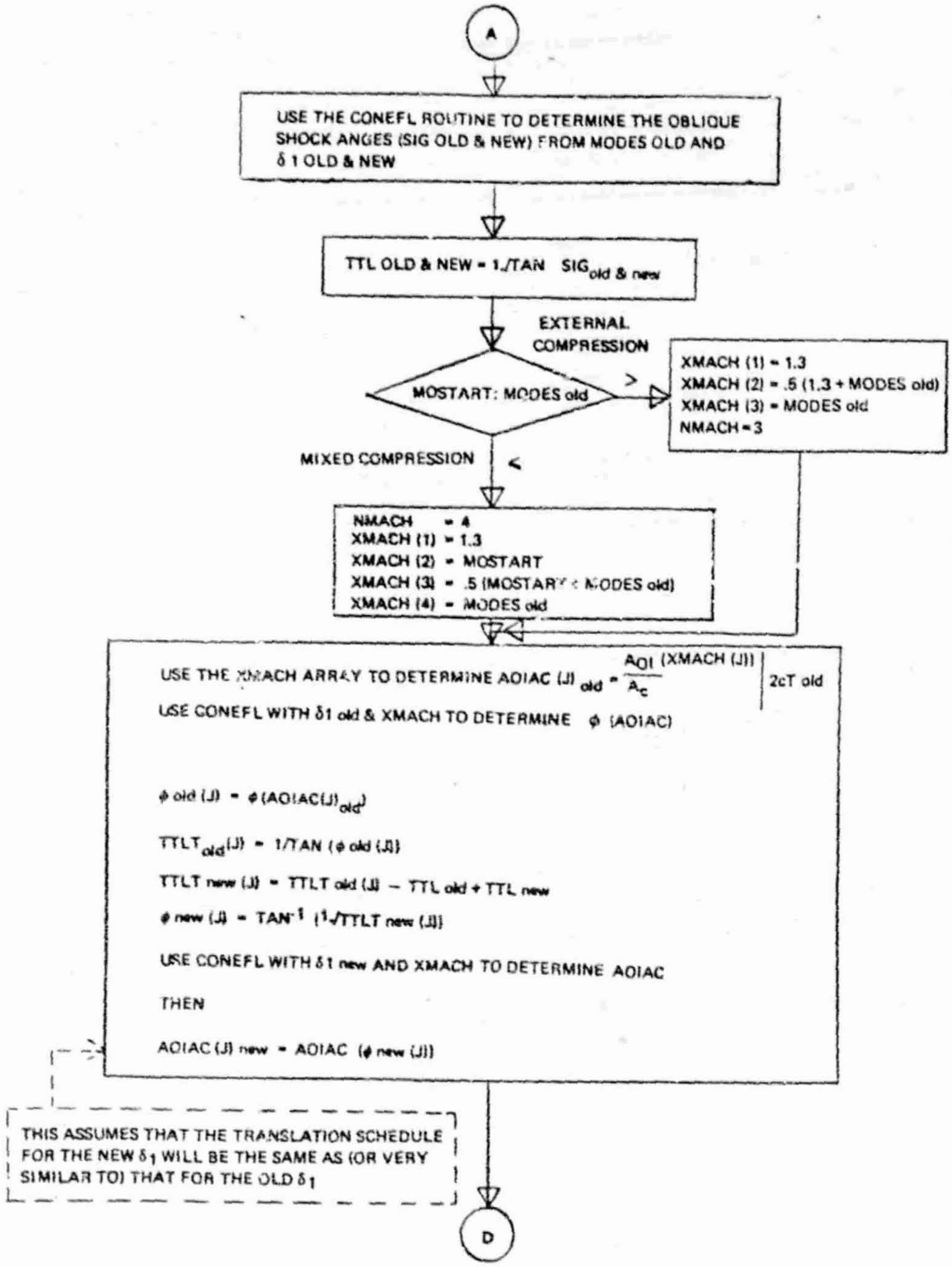


Figure 25. Flow Chart for Step 1 (cont'd)

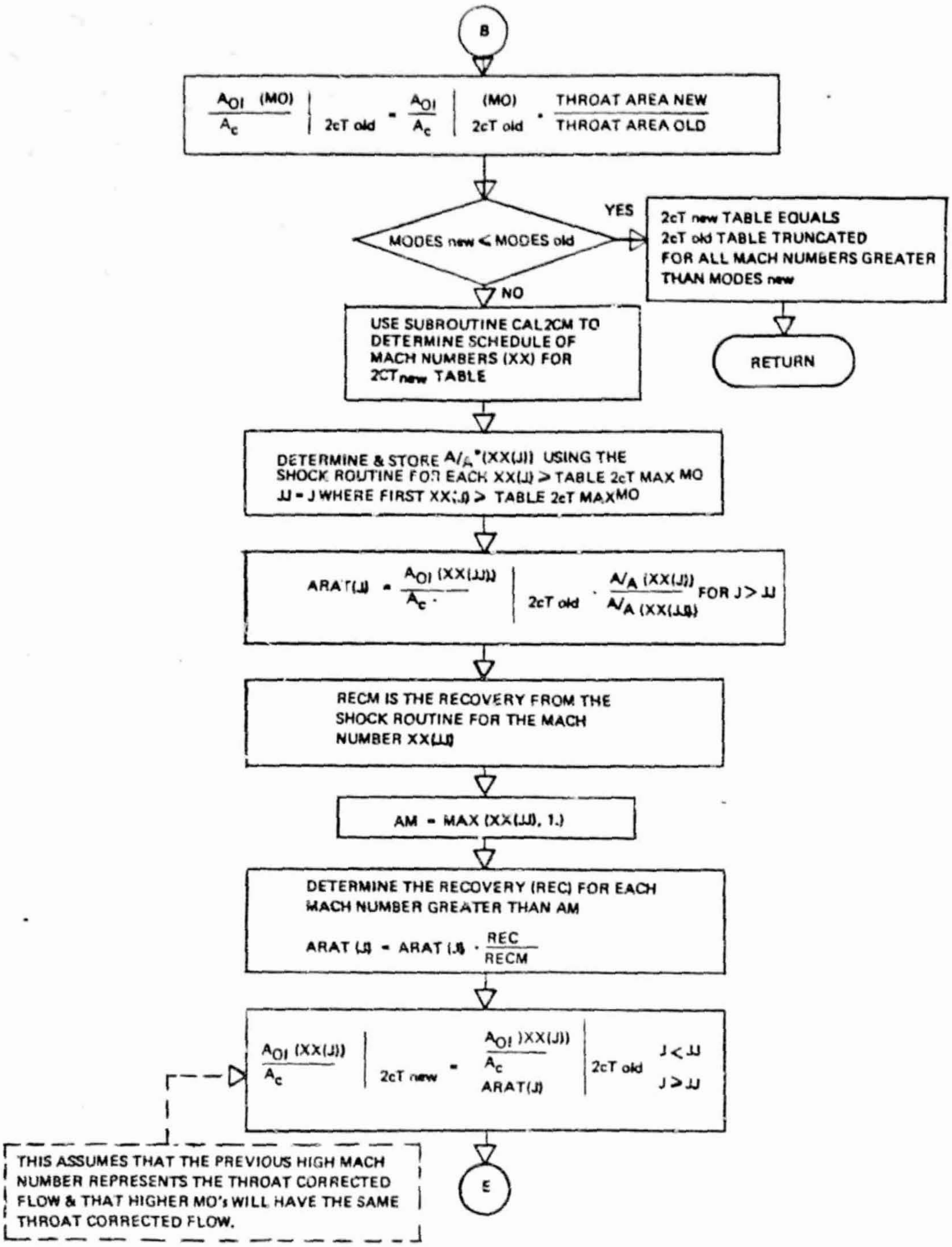


Figure 25. Flow Chart for Step 1 (cont'd)

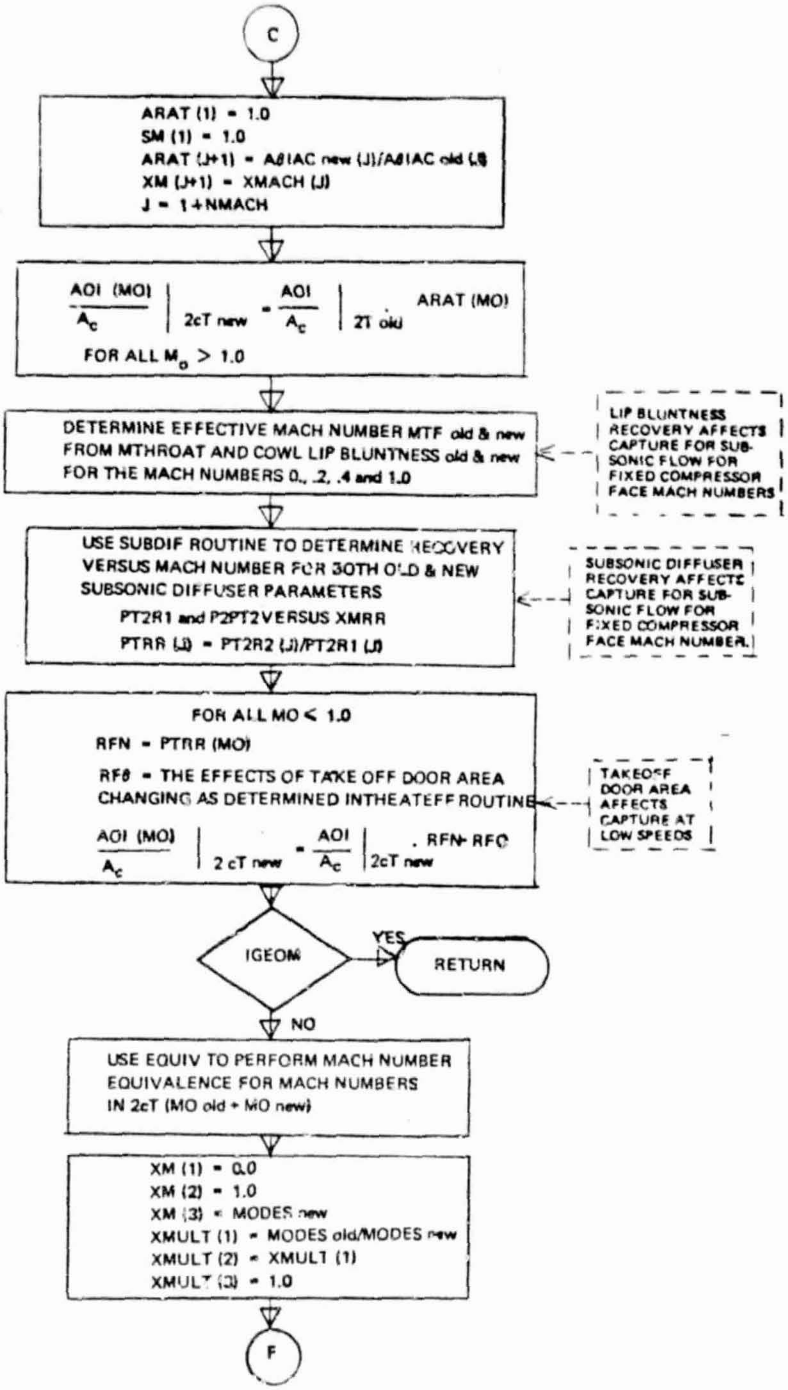


Figure 25. Flow Chart for Step 1 (cont'd)

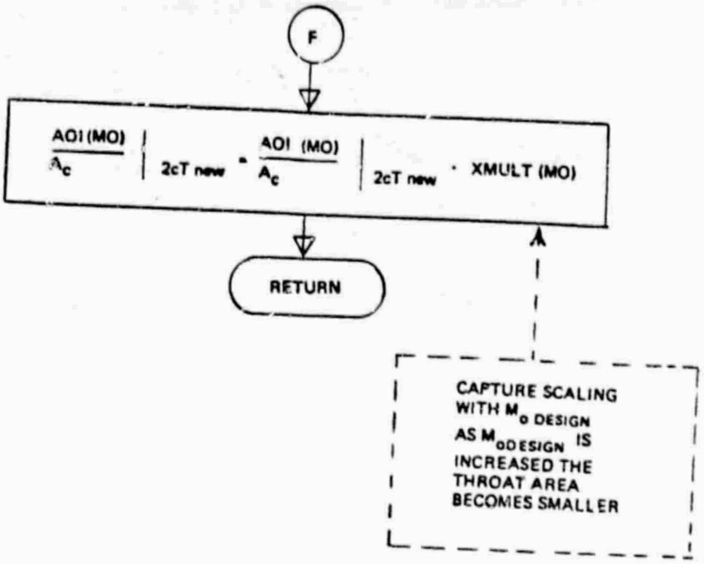


Figure 25. Flow Chart for Step 1 (concluded)

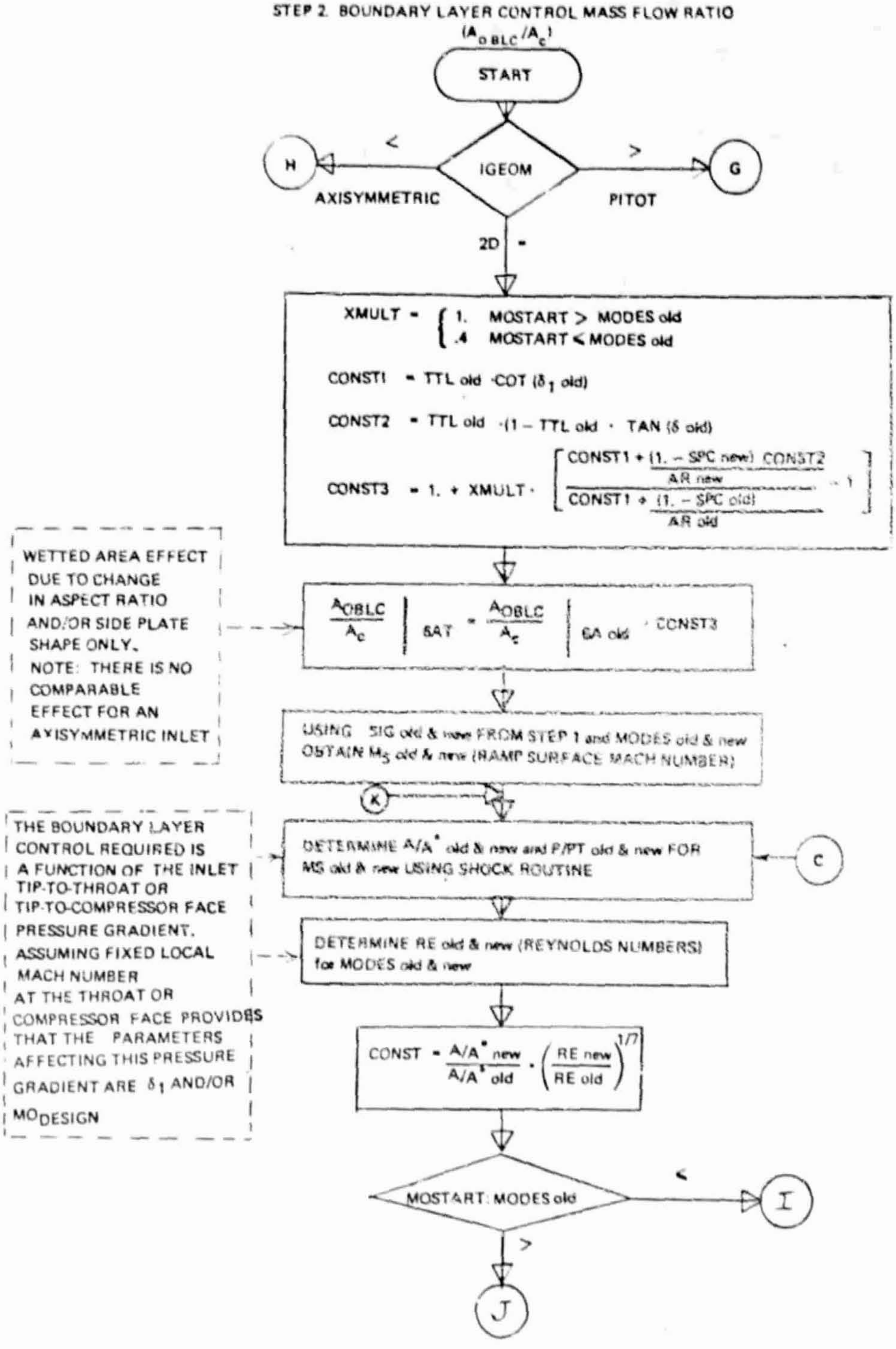


Figure 26. Flow Chart for Step 2

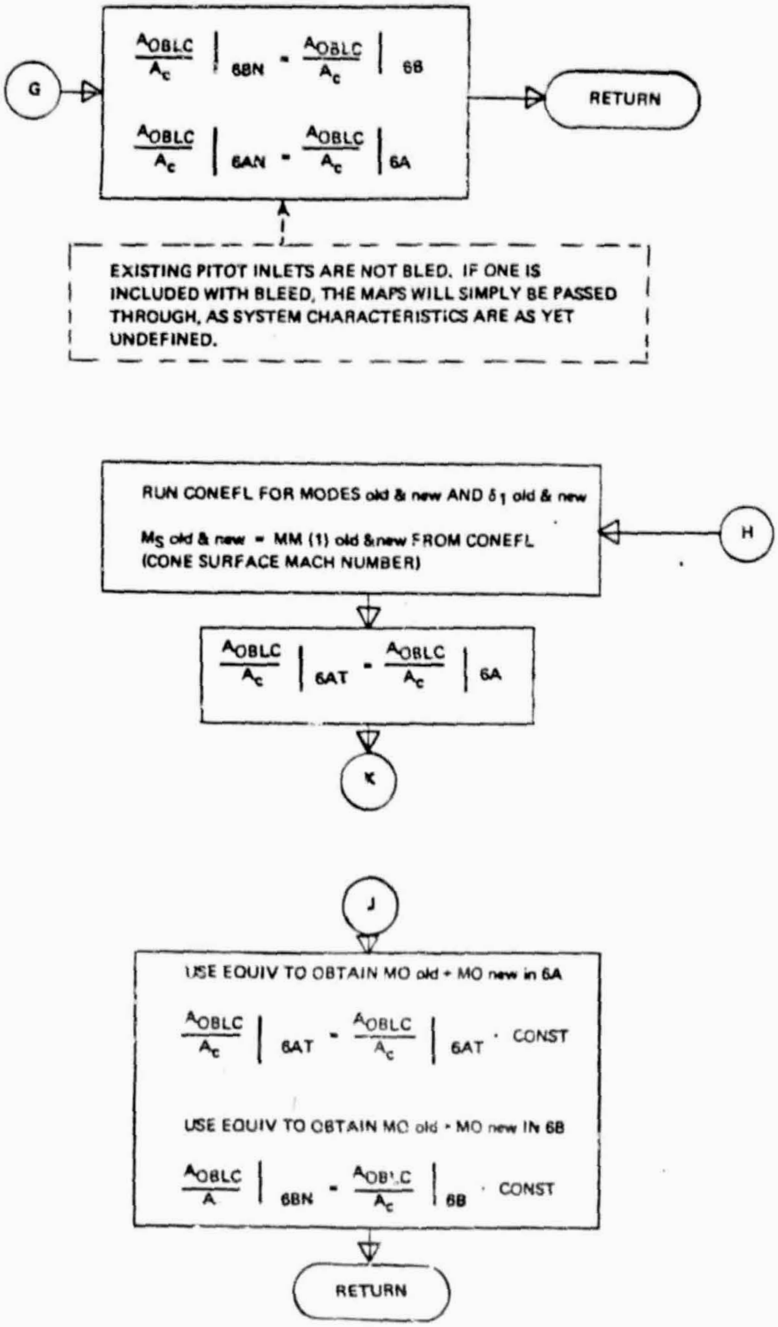


Figure 26. Flow Chart for Step 2 (cont'd)

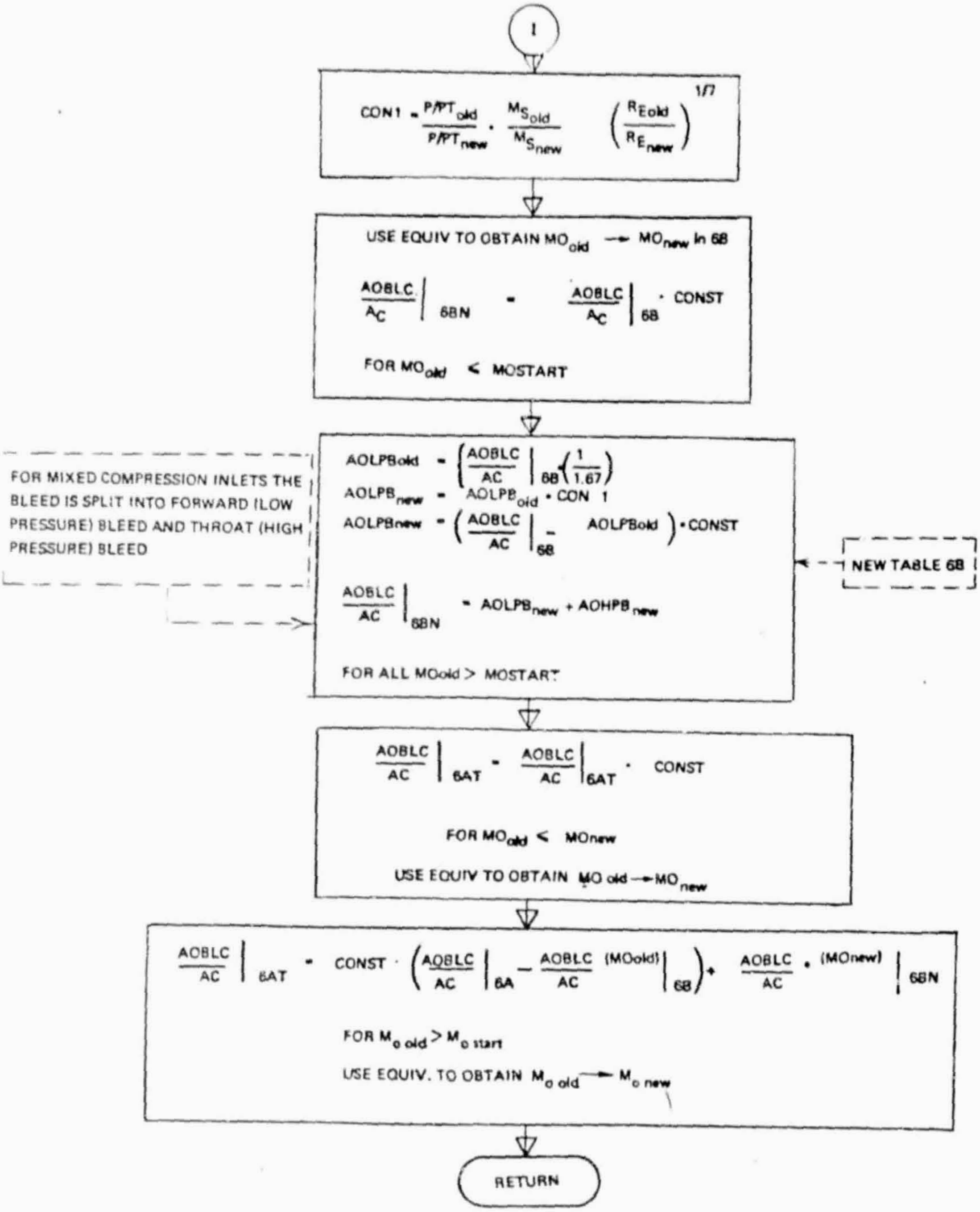


Figure 26. Flow Chart for Step 2 (concluded)

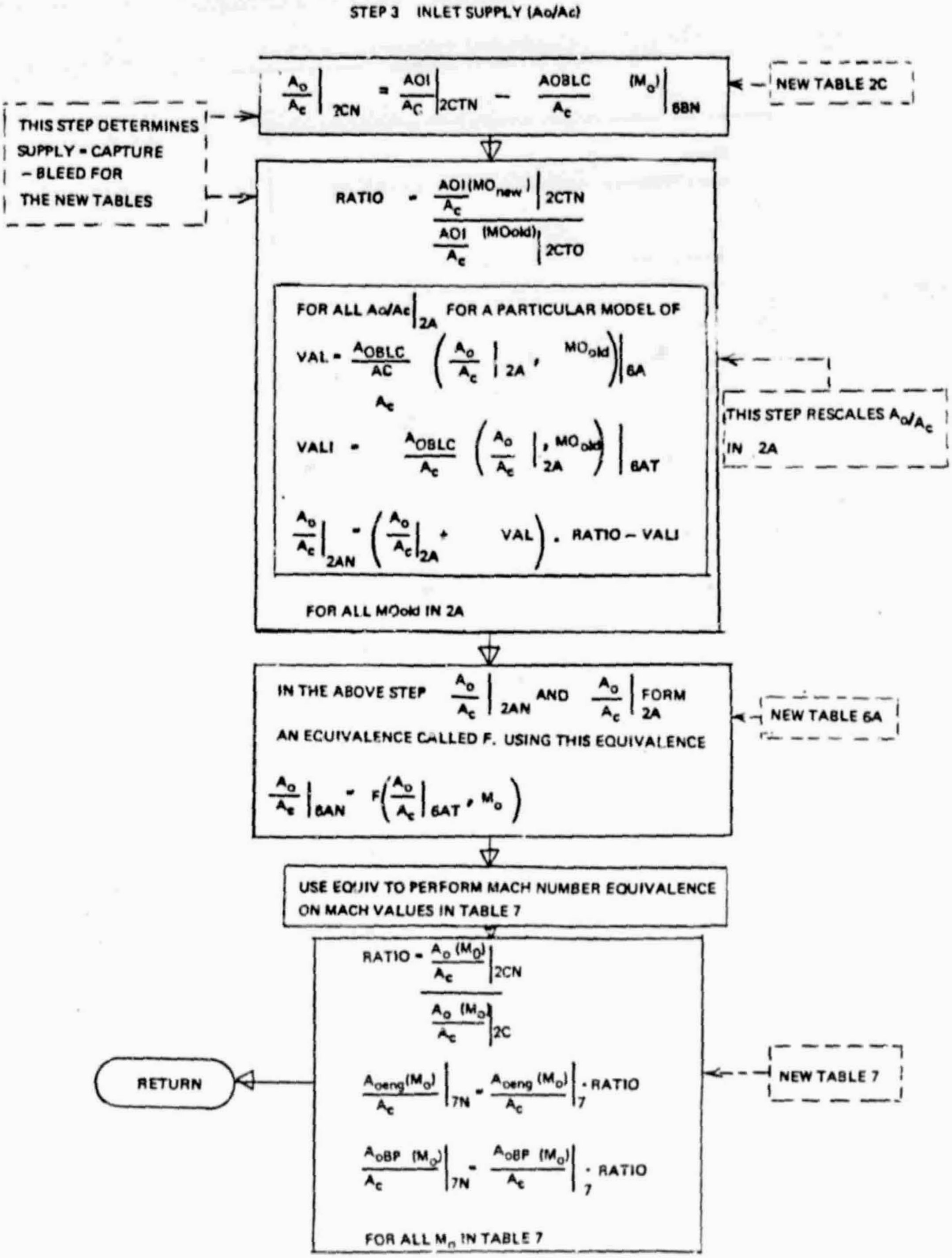


Figure 27. Flow Chart for Step 3

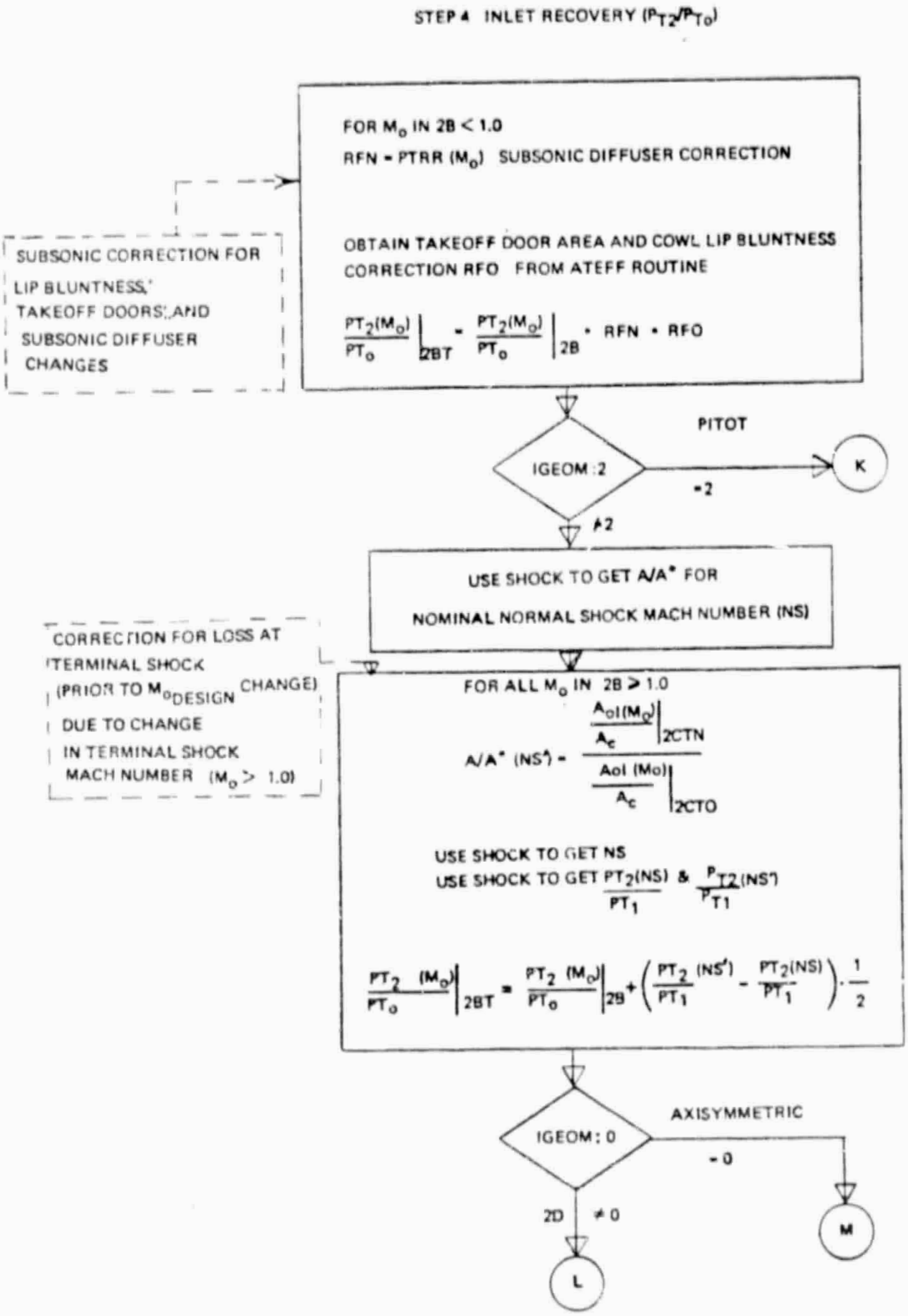


Figure 28. Flow Chart for Step 4

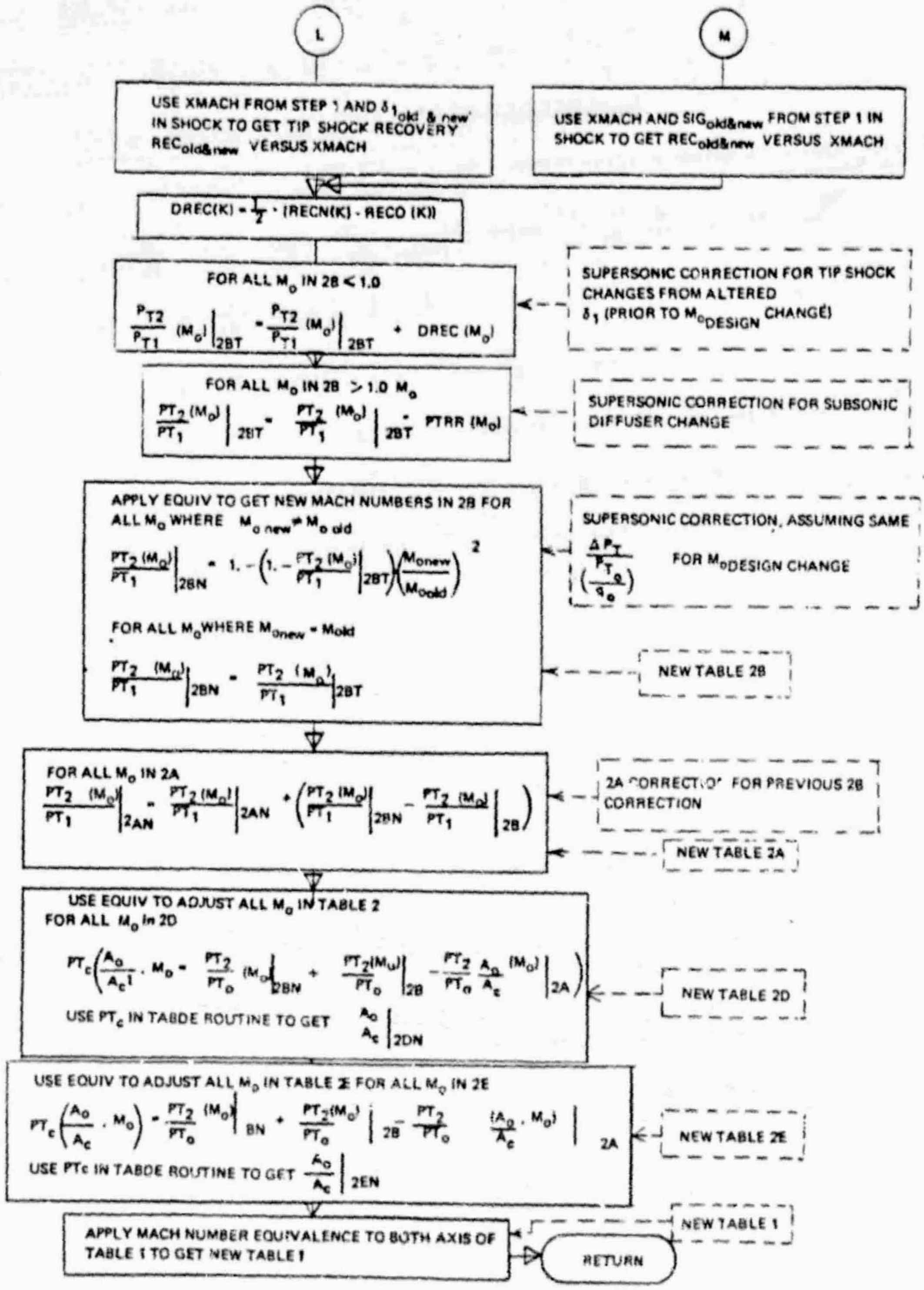


Figure 28. Flow Chart for Step 4 (concluded)

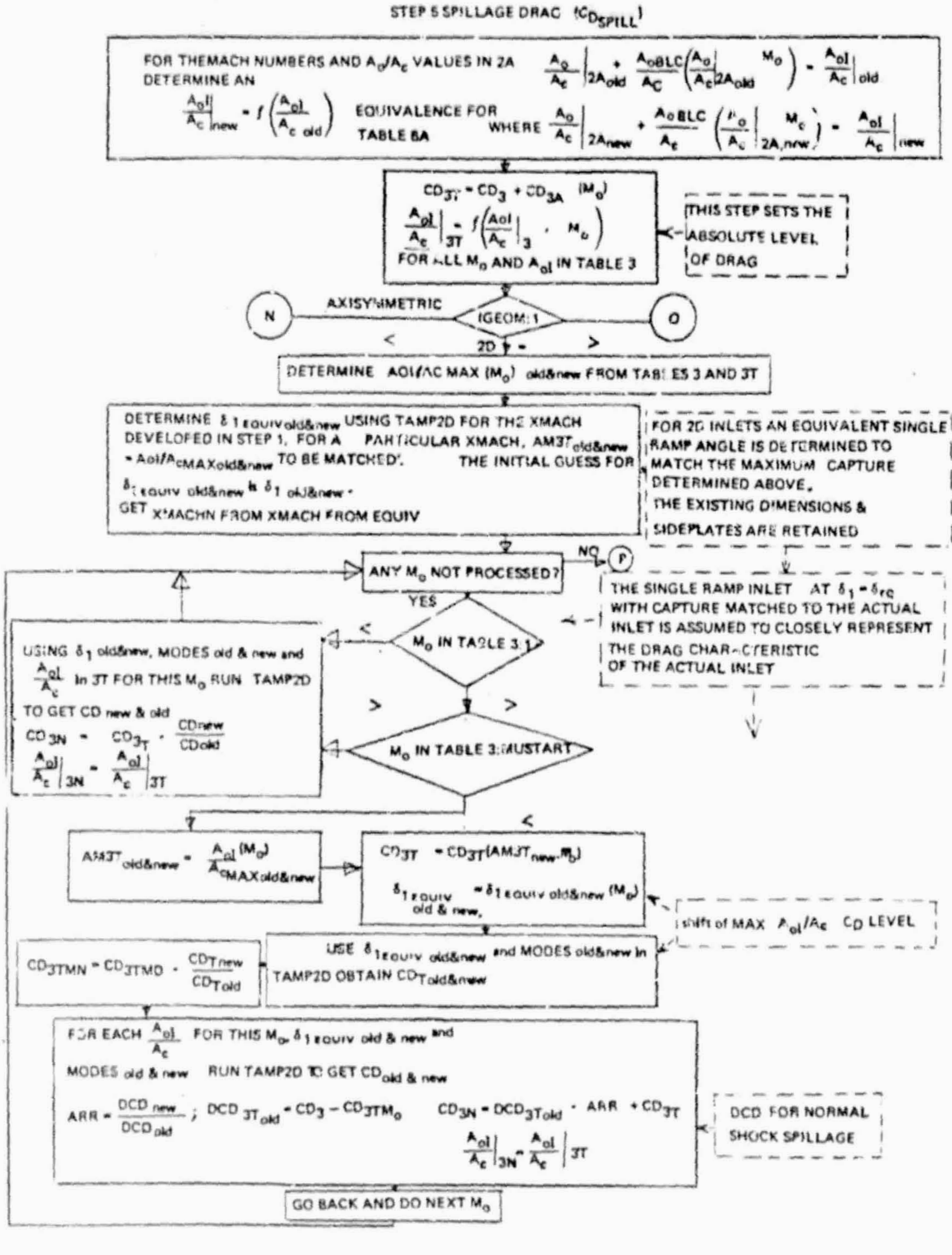
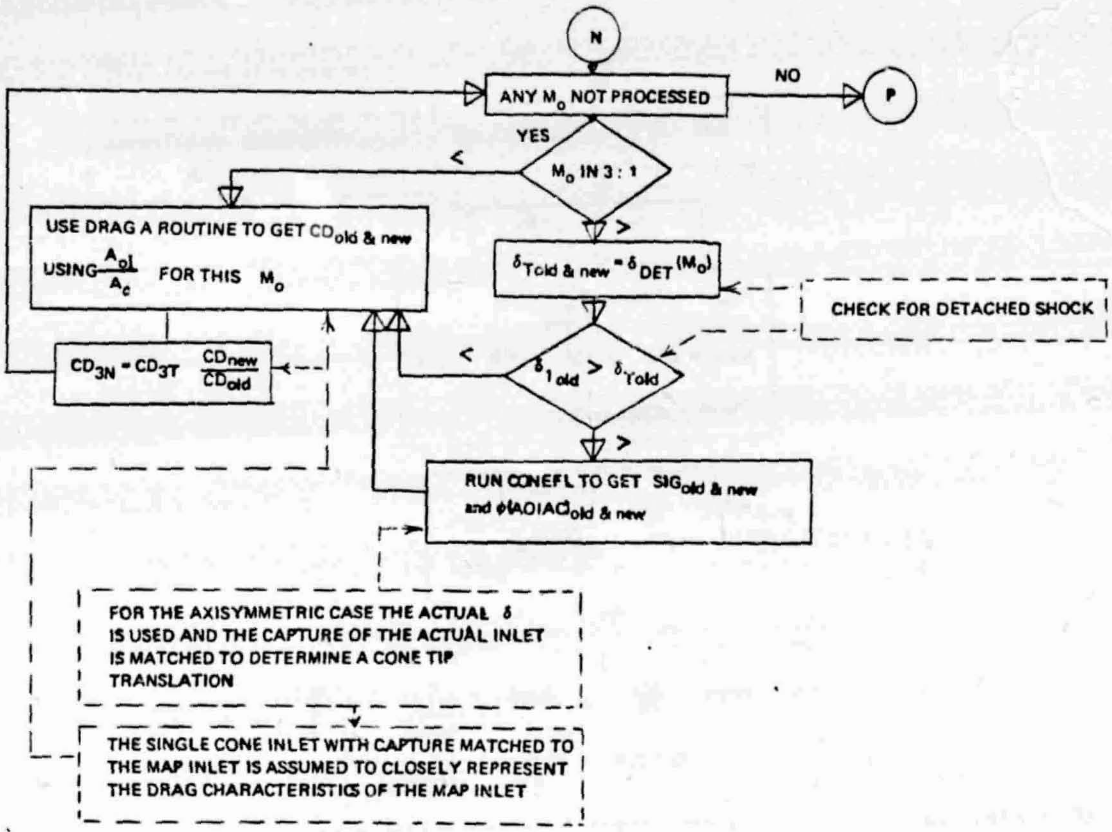


Figure 29. Flow Chart for Step 5



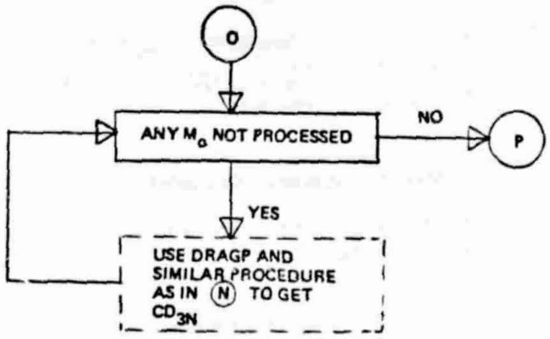


Figure 29. Flow Chart for Step 5 (cont'd)

C-3

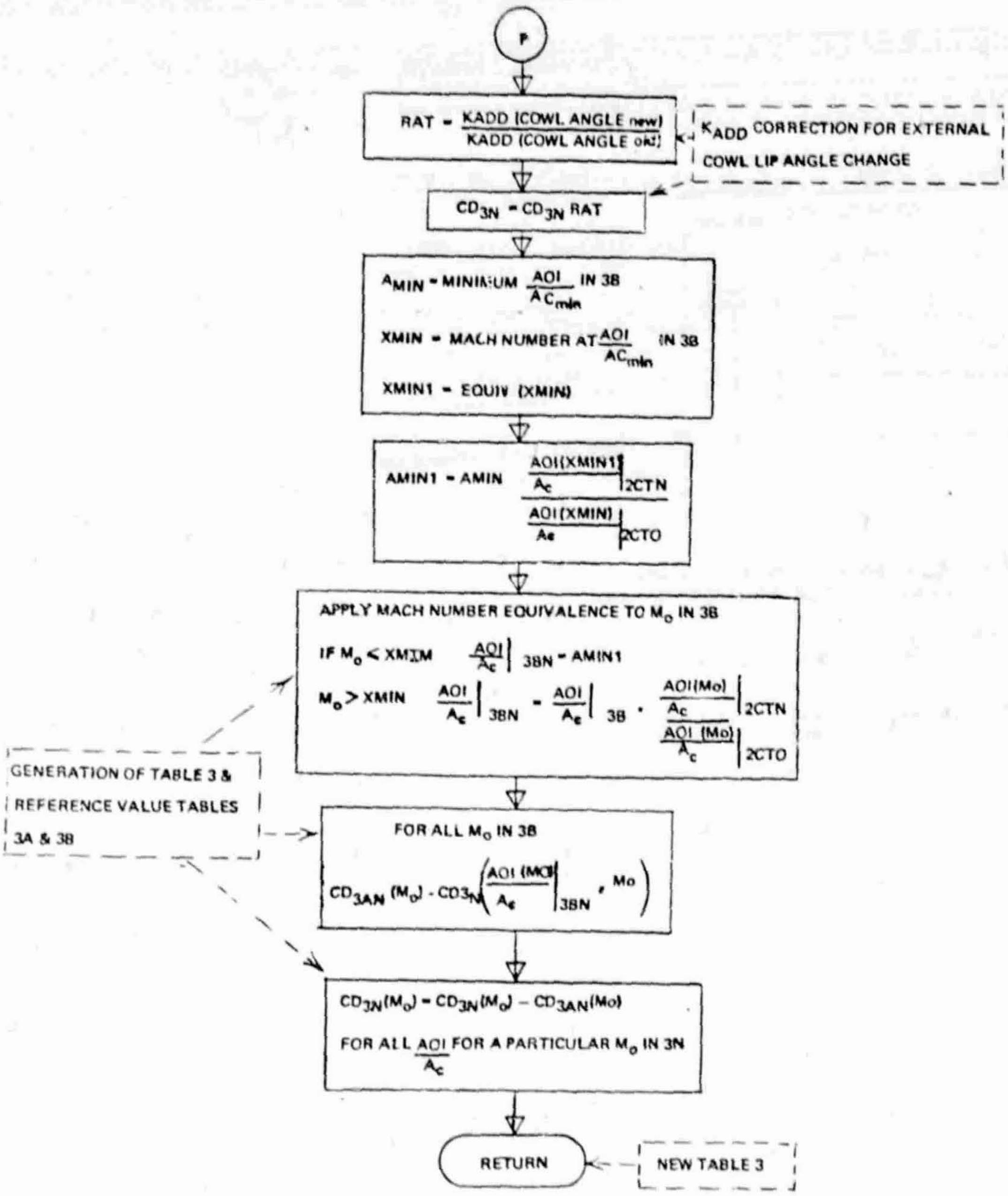


Figure 29. Flow Chart for Step 5 (concluded)

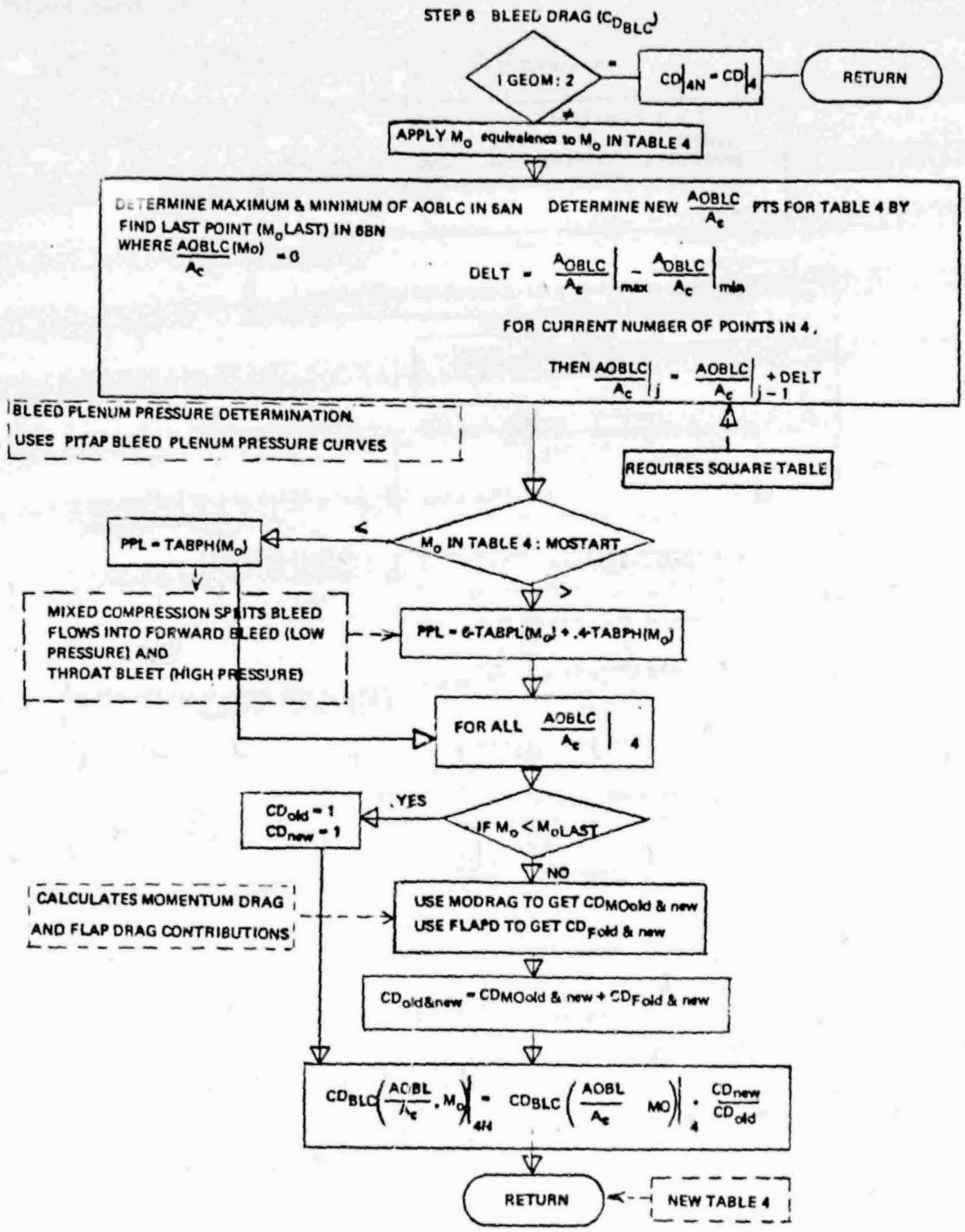


Figure 30. Flow Chart for Step 6

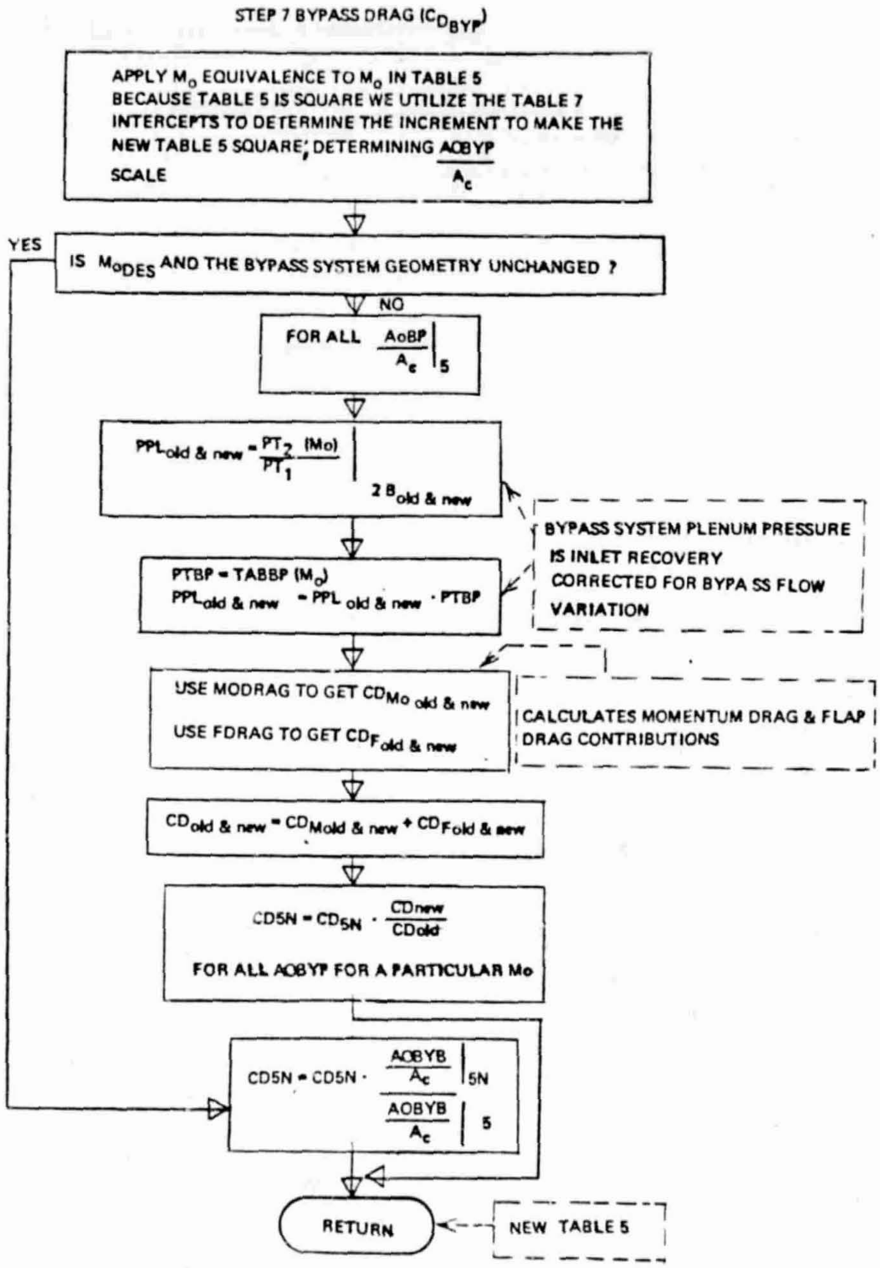


Figure 31. Flow Chart for Step 7

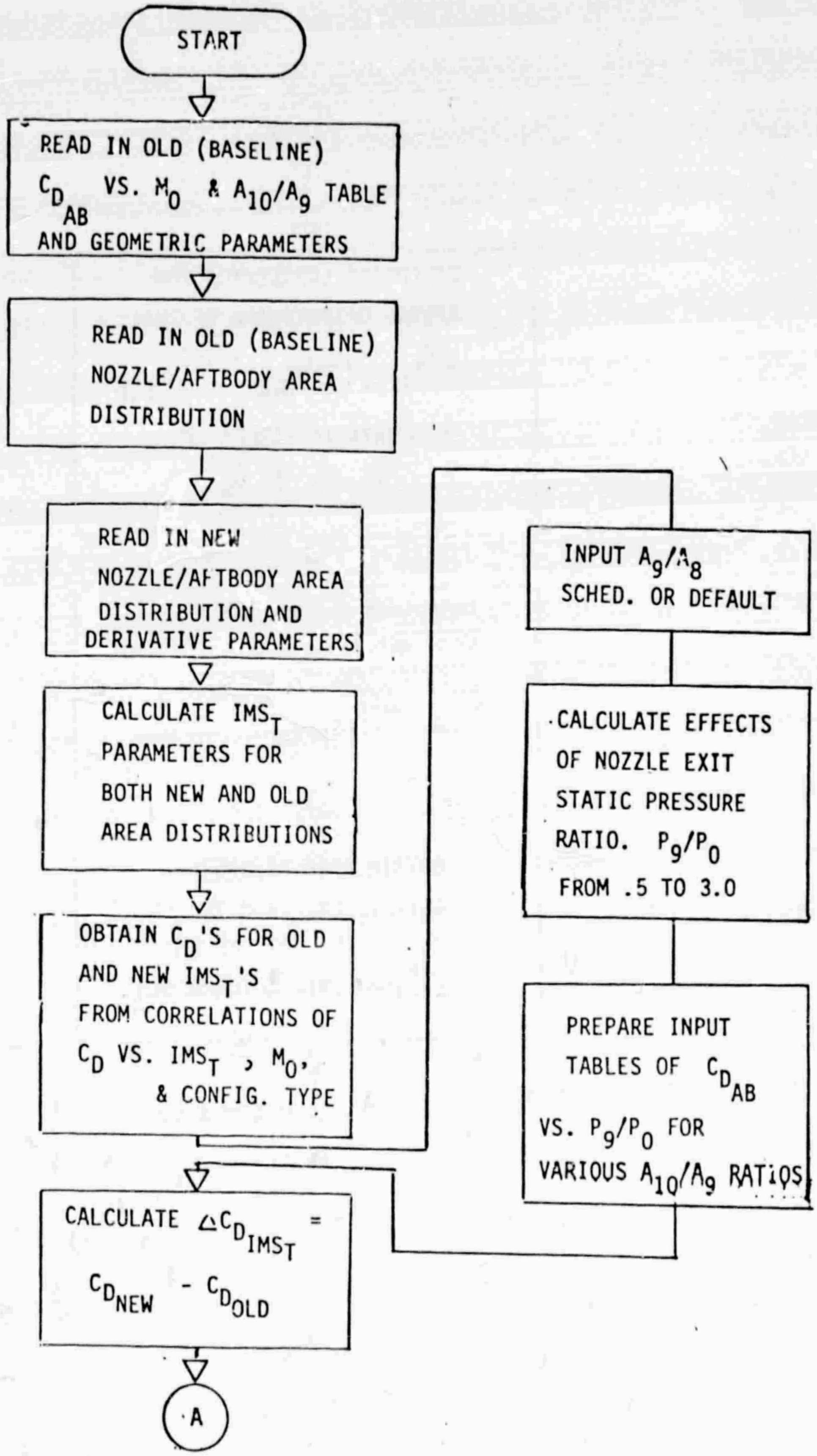


Figure 32. Nozzle/Aftbody Drag Derivative Procedure

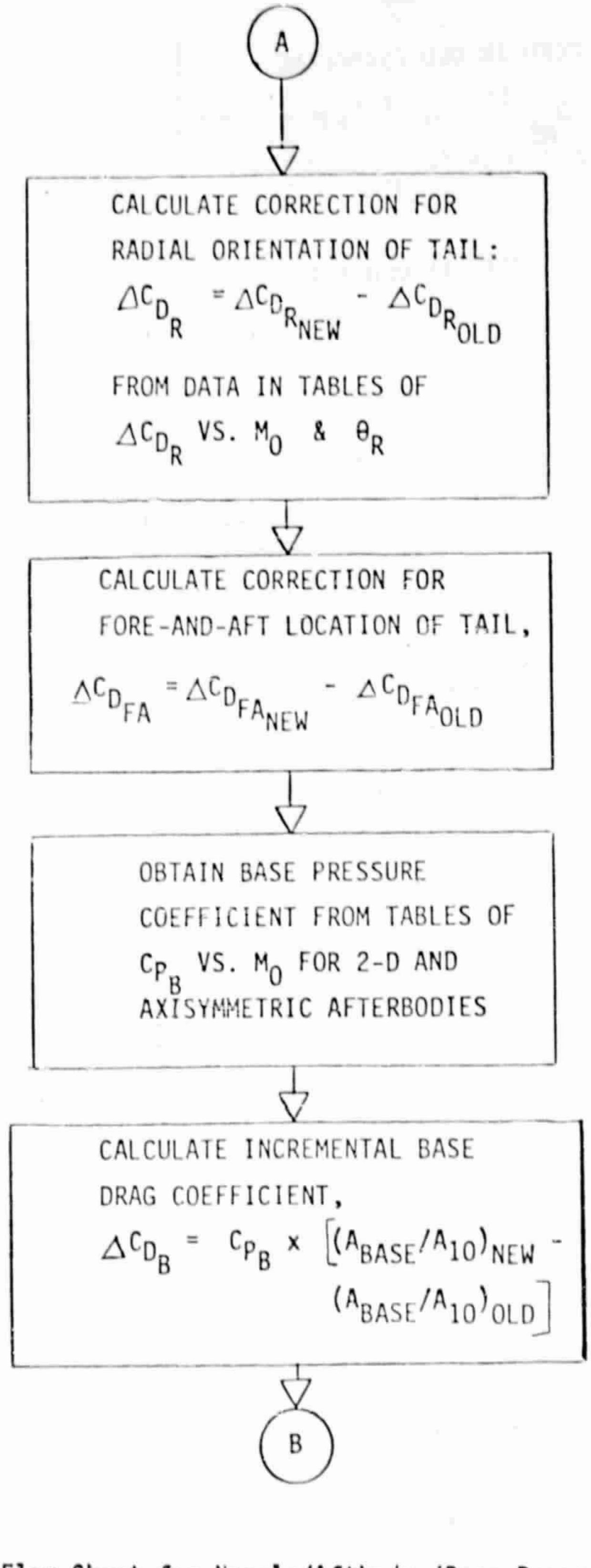
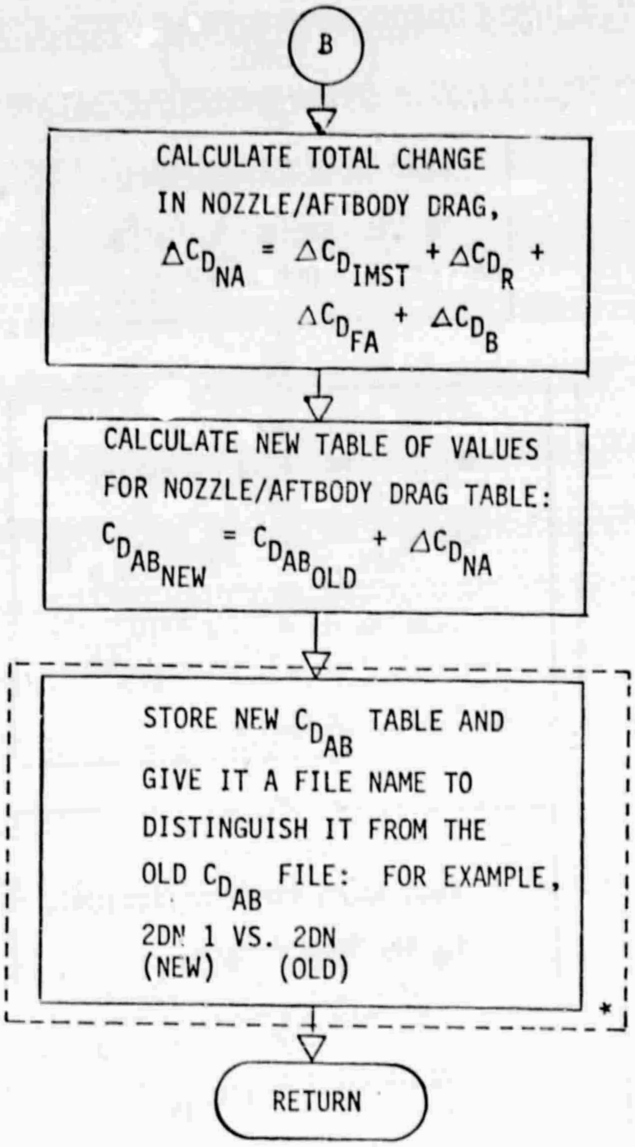


Figure 32. Flow Chart for Nozzle/Aftbody /Drag Procedure (Cont,d)



*ACCOMPLISHED EXTERNALLY TO NORMAL PROGRAM CALCULATION STEPS. SHOWN HERE FOR INFORMATION ONLY.

Figure 32. Flow Chart for Nozzle/Aftbody Drag Procedure (Concluded)

C_{F_G} FOR ROUND C-D NOZZLES

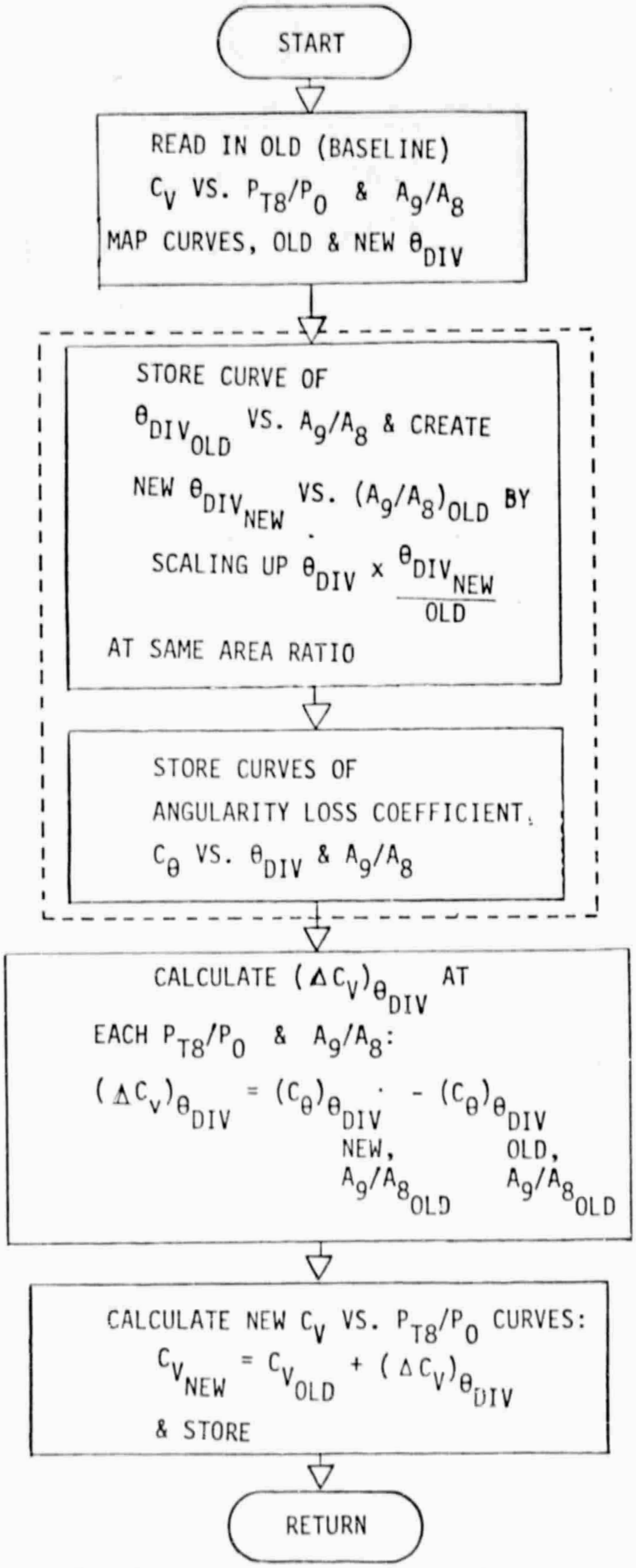


Figure 33. Flow Chart for C_{F_G} Derivative Procedure for a Round C-D Nozzle

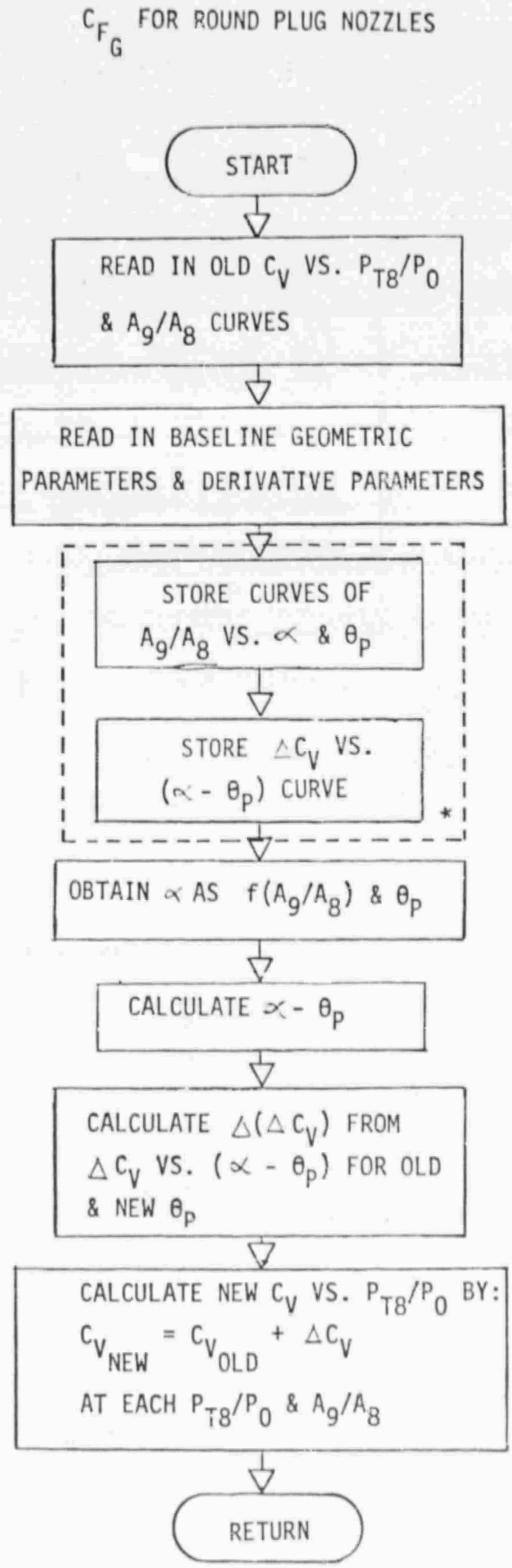


Figure 34. Flow Chart for C_{F_G} Derivative Procedure for a Round Plug Nozzle

2-D/C-D NOZZLE C_{F_G} DERIVATIVE PROCEDURE

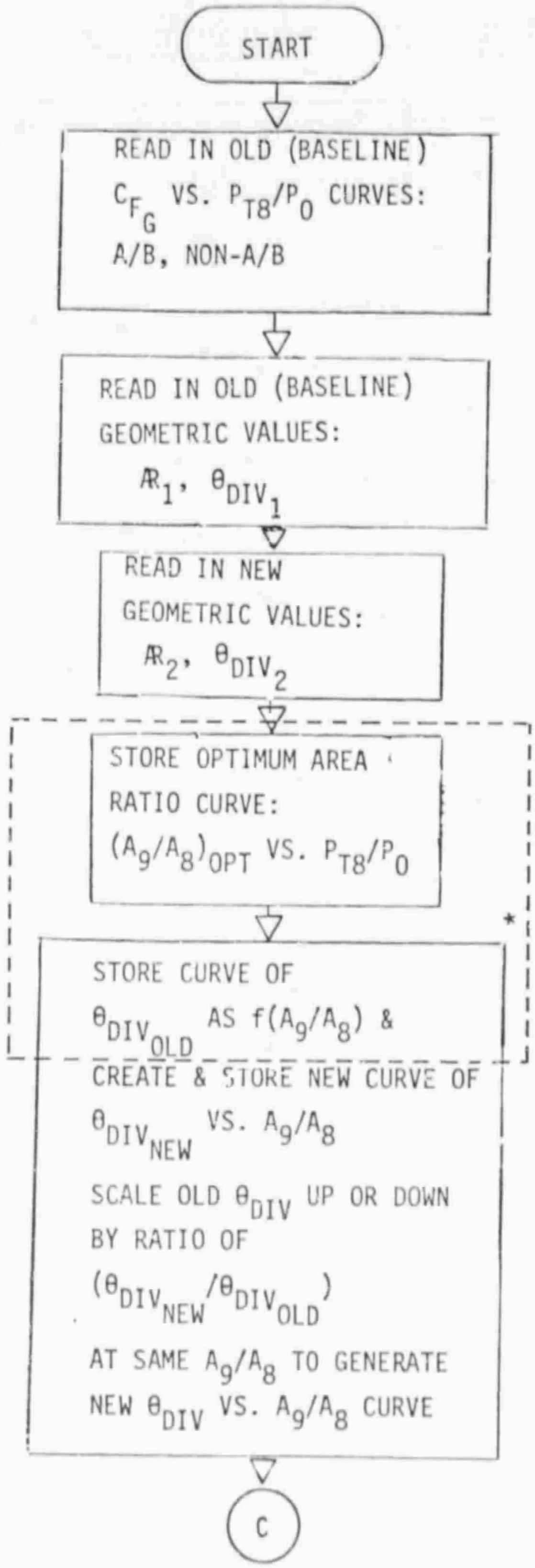


Figure 35. Flow Chart for C_{F_G} Derivative Procedure for a 2-D C-D Nozzle

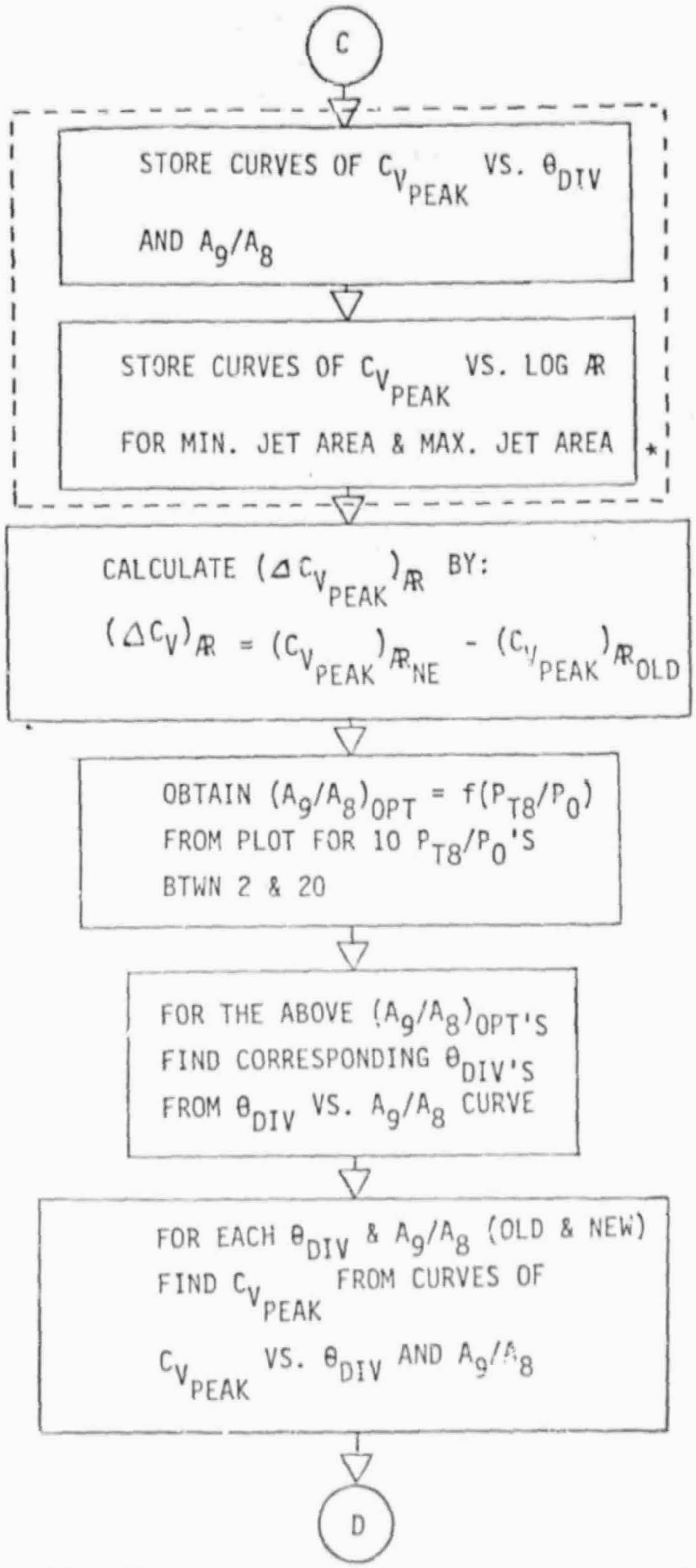


Figure 36. Flow Chart for C_{F_G} Derivative Procedure for a 2-D C-D Nozzle (Cont,d)

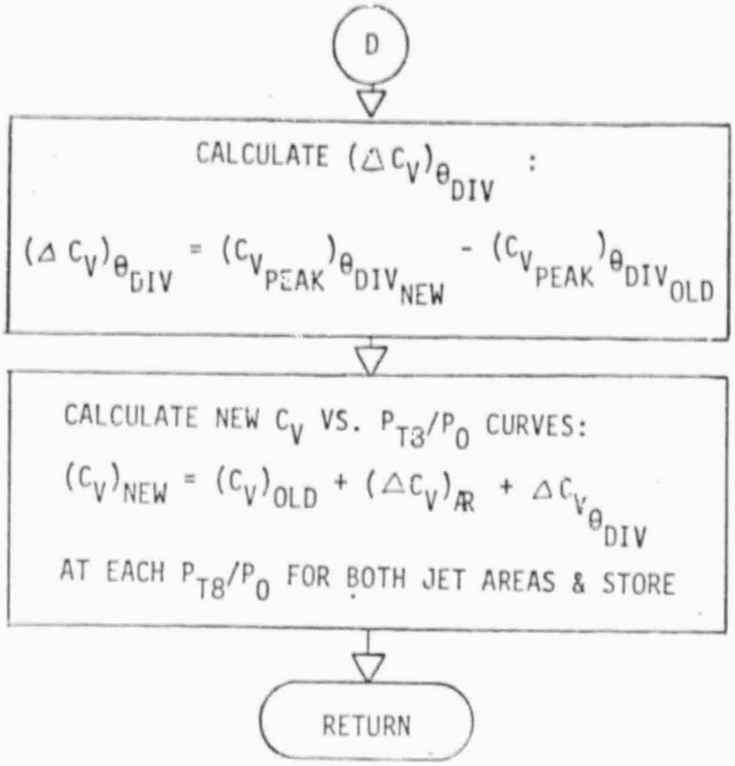
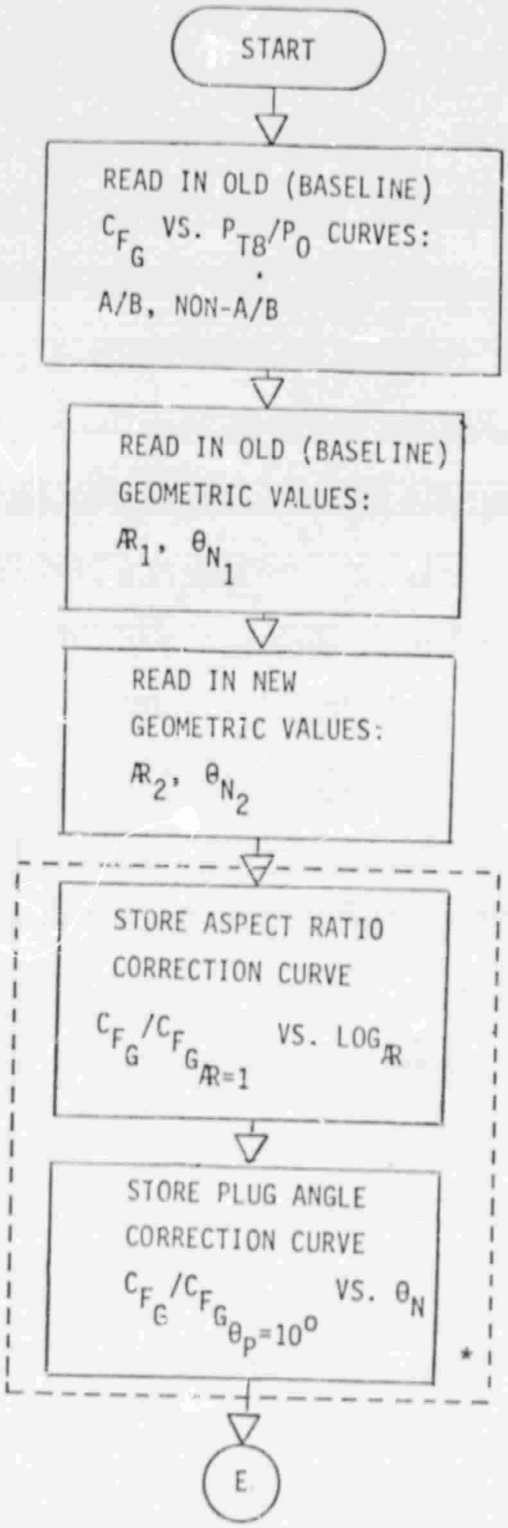


Figure 36. Flow Chart for C_{F_β} Derivative Procedure for a 2-D C-D Nozzle (Concluded)

2-D PLUG NOZZLE C_{F_G} DERIVATIVE PROCEDURE



*BUILT INTO BASIC PROGRAM.
SHOWN FOR INFORMATION ONLY.

Figure 37. Flow Chart for C_{F_G} Derivative Procedure for a 2-D Plug Nozzle

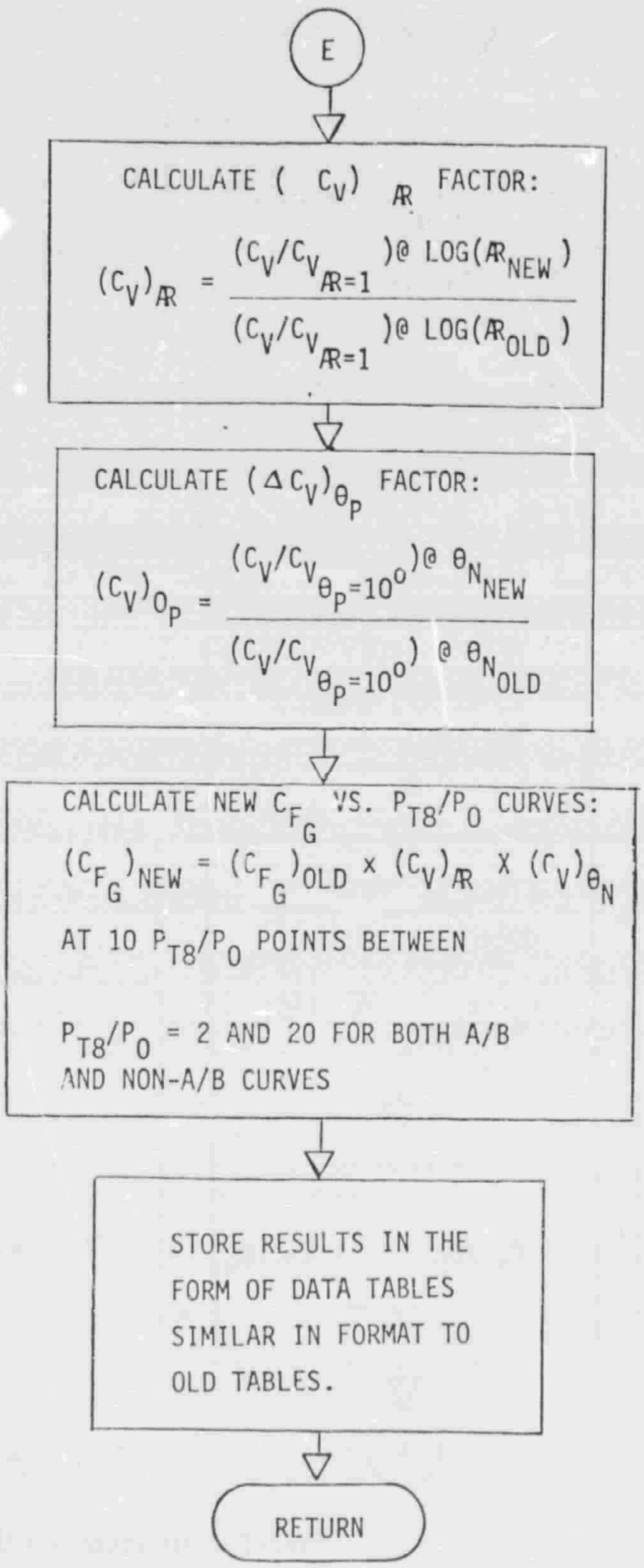


Figure 37. Flow Chart for C_{F_G} Derivative Procedure for a 2-D Plug Nozzle (Concluded)

7.0 PROGRAM AND SUBROUTINE DESCRIPTIONS

7.1 NNEP PROGRAM LIBRARY CATALOG

Subroutine Name	Subroutine Description
BOTM	is the optimization subroutine which uses Powell's Principal Axis method to find the optimum. Once BOTM has been called, it takes over as the supervisory routine until an optimum has been found at which time control is returned to VCENG.
CALCFX	Evaluates the value of the function being minimized or maximized for BOTM.
COMPRS	Performs compressor calculations.
CONFIG	Processes the engine configuration for each mode. The flow components are assembled from inlets to nozzles as they would appear in the flow stream. The logic to be followed in calculating performance is set by CONFIG.
COOLIT	Turbine cooling routine.
DBURNR	Performs duct, burner, and afterburner calculations.
FIGURE	When the configuraton data is read in at the design point for all of the modes, FIGURE schematically represents the flowpath on the output sheets.
FLOCAL	Sequentially calls the components in the correct order to do cycle calculations based on the flowpath generated by CONFIG.
HEATXC	Performs heat exchanger calculations.
INLET	Performs inlet calculations.
INPRT	Subroutine controlling printing. The user has the option of printing each try at balancing of the engine or only the final converged case.
LSTOPT	Outputs station property data every 10th optimization step.
MIN4PT	Performs 4 point least squares search.
DMINV	The IBM 360 double precision matrix inversion routine used to invert the matrix of partial derivatives used in the balancing of the engine.

Subroutine Name	Description
MIXER	Performs mixer calculations.
NAMEPR	Transfers one group of NAMELIST input data from unit 9 to unit 8.
NOZZLE	Performs nozzle calculations.
SPLTR	Performs splitter calculations (bypass engines).
SPLNQ1	Function used to fit cubic splines through the tabular data being interrogated by TREAD. It is used to calculate interpolated or extrapolated values from the tables.
SPSET	Sets up Array of Data for SPLNQ1 interpolation
THERM	Uses built-in cubic spline curve fits for air, stokchiometric combustion products, and water vapor to calculate gas perperties such as: temperature, relative pressure, enthalpy, specific heats, and the Universal gas constant.
TREAD	First is called by INPUT to read in all of the maps in tabular form which are to be used by any of the components. Then, it is called by each of the component subroutines to interrogate the tabular data previously read in.
TURBIN	Performs turbine calculations.
WINJEK	Water injection routine.
CONVERT	Reads column form engine data tables and puts them out in AMAC format.
SUMERY	Prepares a column form summary of engine data for record and later AMAC use
NEPCAL	Determines the values of the error matrix used to balance the enine, determines the new guesses for the independent variables, calls INPUT when directed to by VCCNG, and calls FLOCAL to perform the engine cycle calculations.
INPUT	Reads in all of the input data, and writes out the configuration information as determined by CONFIG for the various modes onto scratch units. It also calls the appropriate data back in when modes are switched. At the design point, INPUT calls FIGURE.

7.2 WATE 2 PROGRAM LIBRARY CATALOG

Subroutine Name	Subroutine Description
COMP	Performs calculations for compressors and fans.
CENCOM	Calculates the mechanical design of centrifugal compressors.
CMECH	Calculates the mechanical design parameters of the axial compressors and fans.
CWT	Calculates the weight and length of fans and compressors.
COMWT	Calculates the weight and length of primary burners, duct burners, and augmentors.
DUCTW	Calculates the weight and length of the ducts.
DUCT	Calculates inlet and exit areas and Mach numbers for various components and their stages.
DUCT1	Calculates the inlet and exit areas for the stage by stage analysis.
EFFD	Converts adiabatic efficiencies to polytropic efficiencies.
FRAME	Calculates the weight of front, intermediate, primary burner frames and turbine exit frames.
STRESS	Calculates blade root stress for the compressors and the turbines.
SHAFT	Calculates the weight of the shafts.
TURB	Performs the turbine calculations and the bookkeeping for the mechanical design.
TMECH	Performs the turbine mechanical design.
CENTUR	Calculates the mechanical design of centrifugal turbines.
TURWTC	Calculates the weight and length of turbine stages.
WMIXR	Calculates the weight and dimension of forced mixers.
WSPLT	Calculates dimensions for non-rotating splitters.
WTNOZ	Calculates dimensions and weight of convergent and divergent nozzles.

Subroutine Name	Description
STHERM	Communicates single precision calls of weight estimating routines for fluid properties with the NNEP routine-THERM
WTEST	Controls the calling of subroutines which will estimate the weight and length of individual components.
NPPNT	Given X ayd Y scales, two points and a character, plot that character in an array.
DTRAP	Draw a trapazoid given start, end, scales, radii, and plot character.
ENGPLT	Makes a printer/plot of the engine components.
DUMMY	Transfers dimensions of arrays.
HMEC	Calculates the weight and length of fixed or rotary heat exchangers.
VALVWT	Calculates the weight and length of AIV.
DWT	Main routine for disk weight calculations.
SIZE	Disk sizing routine.
TVOL	Disk volume calculation routine.
STRES	Calculates disk stress.
DISK	Calculate disk weight.

7.3 INSTALLATION PROGRAM LIBRARY CATALOG

Subroutine Name	Subroutine Description
INSTAL	Installation program's control routine calling all other routines.
INSTLI	Calls the proper installation routines for the inlets bypass vs spillage modes.
AIRBYP	Computes inlet recovery and mass flow ratios for the inlet external compression mode.
AIRSPL	Computes inlet recovery and mass flow ratios for the inlet mixed compression mode.
ATMOS	Determines pressure and temperature as a function of altitude.

Subroutine Name	Subroutine Description
AREAF	An intermediate calculation used by SIZINL.
BYSPL	For OPTB=4, determines the optimum combination of spilled and bypassed air for minimum inlet drag. For OPTB=5, determines the optimum combination of spilled and bypassed air for minimum installed SFC.
BYPM5	For OPTB=4,5 it determines each iteration's split between spilled and bypassed air.
COMIPI	Determines nozzle drag.
FACINT	Calculates the fractional change of a new point from an input table point.
INDRAG	Determines inlet drag.
PLACIN	Reads a card from unit ITEMP=10.
SIZINL	Sizes the inlet capture area.
TBLU1	One-dimensional table lookup routine.
TBLU2	Two-dimensional table lookup routine.
TBLU3	Three-dimensional table lookup routine.
TERP1	Performs one-dimensional interpolation.
TERP2	Performs two-dimensional interpolation.
TERP3	Performs three-dimensional interpolation.
TABL1	Inputs one-dimensional tables.
TABL2	Inputs two-dimensional tables.
TABL3	Inputs three-dimensional tables.
SEARCH	Binary search routine.
TABL22	Inputs skew symmetric two-dimensional tables.
TABLU22	Two-dimensional skew symmetric table lookup routine.
WARN	Outputs warning messages when installtion program limits are encountered.

Subroutine Name	Subroutine Description
TABIN	Inputs all inlet, aftbody and CFG tables.
MAPOUT	Calls routines which output old and new installation maps.
MAP1	Outputs one-dimensional maps.
MAP2	Outputs two-dimensional maps.
MAP2N	Outputs aftbody maps.
MPA2C	Outputs CFG maps.
MAP22	Outputs skew-symmetric two-dimensional maps.
MAP3	Output three-dimensional maps.
LDATA	Prints out installed data in long format.
SDATA	Prints out installed data in short form.
DEMAND	Calculates engine demand as a function of inlet recovery.
NDRAG	Determines nacelle drag.
SWITCH	Transfers old maps to new map storage locations.
ADD12	Generates a CFG table in NNEP format for addition to the NNEP data base.
NACWET	Determines nacelle wetted area.
INLWT	Determines inlet and/or nacelle weight.

7.4 DERIVATIVE PROCESSOR PROGRAM LIBRARY CATQALOG

DERIVT	This is the derivative procedure main control routine. It calls the derivative procedure input routine and the calculation routine.
DERIN	Calls the routines which input the derivative parameters.
INLETI	Inputs and converts the inlet derivative parameters.
NAFTI	Inputs and converts the nozzle/aftbody derivative parameters.

Subroutine Name	Subroutine Description
CVI	Inputs and converts the CFG derivative parameters.
DERCL	Calls the three routines which calculate the new derivative parameters.
COT	Cotangent function subprogram.
ADJUST	Adjust tables 3 and 7 to contain zero end points for each curve.
TAMP2D	Calculates AOI/AC and CD for a 2D-inlet.
IDDEF	Calculates 2D inlet shock properties.
SPILL	Calculates AO/AC sideplate.
CUBIC	Solves for the roots of a cubic equation.
CURT	Calculates /A/ sign (A)
SHOCK	Calculates shock properties.
ERROR	Error return subroutine (not currently fully implemented).
EQUIV	Performs Mach number equivalence.
CALM	Calculates the number and value of Mach numbers above and below Mach=1 for Pitot inlet calculations.
CALN	Extends and modifies Mach numbers used in tables when $Modes_{new}$ $Modes_{old}$ for Pitot inlets.
CONEFL	Determines AOI/AC and CD for an axisymmetric inlet.
THETA	Calculates airflow angle.
MINT	An iteration routine which finds the root of a given function over a given range.
INLETC	Accessses routines STEP1 through STEP1.
STEP1	Determines new inlet capture.
STEP2	Determines new inlet bleed.

Subroutine Name	Subroutine Description
STEP3	Determines new inlet supply.
STEP4	Determines new inlet recovery.
SUBDIF	Determines ratio of inlet airflows versus Mach number ratio given modes, aspect ratio, A2/A1 ratio, $D_{2\ wall}$ and subsonic diffuser coefficient.
ATEFF	Determines the ratio of effective throat areas.
TABP	Determines recovery given subsonic diffuser coefficient.
STEP5	Determines new spillage drag.
STEP6	Determines new bleed drag.
STEP7	Determines new bypass drag.
DRAGP	Determines AOI/AC and CD for Pitot inlets.
DRAGA	Determines AOI/AC and CD for axisymmetric inlets.
CRCALC	Determines ratios of gemoetric parameters.
MOMDRG	Calculates momentum drag for an inlet bypass system.
CNIMD	Calculates drag for a convergent nozzle.
CONVMD	Calculates drag for a convergent-divergent nozzle.
FLAPD	Calculates flap drag for an inlet bypass system.
AFTBC	Determines new aftbody drag tables as well as delta CD table.
AREA	Sets up the area versus station distribution used by IMST routine.
CDCALC	Calculates theoretical aftbody CD.
IMST	Calculates the integrated mean square area for an area versus station distribution.
PARBL	Evaluates the integral of tabular data using equally spaced abscissa.
COMCUB	Finds the slope at a set of data points of the cubic spline passing through the points for specified end conditions.

Subroutine Name	Subroutine Description
CVC	Calculates new CFG table.
DCDC	Calculates drags due to base area, tail fin location, and tail fin rotation.

7.5 ANALYTICAL DESIGN AND PERFORMANCE METHOD FOR PITOT INLETS

Subroutine Name	Subroutine Description
PITOTD	Main program.
ENGSZE	Calculates inlet capture area.
LOWSPD	Determines inlet recovery for Mach No. $< .4$
SUBTRA	Determines inlet recovery for $.4 \leq$ Mach No. ≤ 1.0
SUPER	Determines inlet recovery for Mach No. > 1.0
FMEFF	Determines effective throat Mach number as a function of geometric throat Mach number and r/D.
XFMEFF	Determines geometric throat Mach number as a function of effective throat Mach number and r/D.
MMDRG	Determines momentum drag for an inlet bypass system.
CDMDP	Determines performance for a CD bypass nozzle system.
CMDP	Determines performance for a convergent bypass nozzle system.
FLPDG	Determines flap drag for an inlet bypass system.
BYPPIT	Determines optimum combination of spilled and bypassed air for minimum inlet drag.

Subroutine Name	Subroutine Description
DESPIT	Determines inlet contours of subsonic and supersonic pitot inlets.
SPILIT	Determines additive drag.
XKADD	Determines K_{ADD} factors for pitot inlets.

7.6 "NWC" INLET DESIGN AND ANALYSIS PROGRAM FOR TWO-DIMENSIONAL INLETS

Subroutine Name	Subroutine Description
ADD	Computes supersonic additive drag portion of total inlet additive drag for subcritical operation
AOTRIA	Computes internal angles of a triangle given the length of the three sides
ATH	Computes the cowl lip plane area of a two-dimensional inlet
BLDDR	Uses empirical data to estimate boundary layer diverter drag
BLEED	Computes bleed/bypass airflow and drag
CALSIS	Obtains a same family shock-shock intercept solution referred to arbitrary reference conditions
CLREST	Estimates a typical cowl lip radius for given design Mach number
CONVG	Iteratively solves for the intercept of a shock polar and the straign line representing an isentropic wave
COORD	Gives the intercept of two straight lines each defined by a point an slope
CWLDRG	Computes cowl lip and wave drags
DEFMAX	Computes shock detachment deflection for a given Mach number

Subroutine Name	Subroutine Description
DUCFLO	Computes approximate two-dimensional supersonic duct flow for (a) single shock train (b) double shock train (c) shock-expansion train in the duct - On the UNIVAC 1108 subprogram DUCFLO computes flows (a) and (b) and subprogram DUCSHX computes flow (c)
DGEOM	Computes cowl lip plane area, throat area, subsonic diffuser area ratio and divergence angle and area ratios from the duct throat to the cowl lip plane and from the normal shock position to the duct throat
FAREAT	Computes area of a triangle given 3 coord points defining same
FASTAR	Computes A*/A for given Mach number for $\gamma = 1.4$
FDEL	Computes deflection angle through weak oblique shock given Mach number and sin for shock angle for $\gamma = 1.4$
FLENGT	Computes distance between two given coord points
FMDOT	Computes mass flow function, m, for given Mach number for $\gamma = 1.4$
FOREB	Dummy routine which may be used to input empirical forebody effects
FPNS	Computes static pressure ratio across normal shock for given Mach numer for $\gamma = 1.4$
FPTNS	Computes total pressure ratio across normal shock for given Mach number for $\gamma = 1.4$
FPTOP	Computes ratio of total to static pressure for given Mach number for $\gamma = 1.4$
FPYTHG	Computes distance between two given coord points
FQOP	Computes ratio of dynamic to static pressure for given Mach number for $\gamma = 1.4$
FREST	Determines typical lip radius for given design Mach number
FST	Computes tan 0 given sin 0
FTCTT	Computes ratio of static to total temperature for given Mach number for $\gamma = 1.4$

Subroutine Name	Subroutine Description
FUBOVO	Computes average lateral velocity ratio along a vertical line in a conical field
FUOVO	Computes lateral velocity ratio at a point in a conical vield
FXTAR	Given two points and an angle, translates point 1 to the origin, translates the x coord of point 2 to its corresponding position, and rotates same through the given angle
FYTAR	Same as FXTAR for the y coord of point 2
GAOAS	Computes A/A* for given Mach number and γ
GASTAR	Computes A*/A for given Mach number and γ
GDEL	Computes deflection angle through weak oblique shock given Mach number, γ , and sin of the shock angle
GEXTH	Computes stream thrust/unit area given total pressure, Mach number and γ
GM2NS	Computes Mach number downstream of normal shock given upstreamMach number and γ
GM2OS	Computes Mach number downstream of weak oblique shock given upstream Mach number, shock angle and γ
GMDOT	Computes mass flow function, $\dot{m}$, for given Mach number and γ
GMP	Computes Mach number for given ratio of static to total pressure and γ
GMR	Computes Mach number for given ratio of static to total density and γ
GMT	Computes Mach number for given ratio f static to total temperature and γ
GPM	Computes Prandtl-Meyer angle for given Mach number and γ
GPNS	Computes static pressure ratio across normal shock for given Mach number and γ
GPOPT	Computes ratio of static to total pressure for given Mach number and γ

Subroutine Name	Subroutine Description
GPOS	Computes static pressure ratio across weak oblique shock given Mach number, shock angle, and γ
GPPTMC	Computes product of mass flow function and static to toal pressure ratio, $\dot{m}\ P/P_t$, for given Mach number and γ
GPTNS	Computes total pressure ratio across a normal shock for given Mach number and γ
GPTOP	Computes ratio of total to static pressure for given Mach number and γ
GPTOS	Computes total pressure ratio across weak oblique shock given Mach number, shock angle, and γ
GQOP	Computes ratio of dynamic to static pressure for given Mach number and γ
GQOPT	Computes ratio f dynamic to total pressure for given Mach number and γ
GRNS	Computes static density ratio across a normal shock for given Mach number and γ
GRORT	Computes ratio of static to total density for given Mach number and γ
GROS	Computes static density ratio across a weak oblique shock given Mach number and γ
GSPSND	Computes speed of sound given static temperature and γ
GTNS	Computes static temperature ratio across a normal shock given Mach number and γ
GTOS	Computes static temperature ratio across a weak oblique shock given Mach number, shock angle, and γ
GTOTT	Computes ratio of static to total temperature given Mach number and γ
INDRAG	Computes subcritical mass flow and drag as a function of shock position for a multiple ramp two-dimensional inlet
ILEARS	Solves the flow field resulting from the intercept of a "lumped" left running expansion and a right running shock
IREALS	Solves the flow field resulting from the intercept of a "lumped" right running expansion and a left running shock

Subroutine Name	Subroutine Description
ISODES	Computes the isentropic wedge contour, critical additive drag and performance of an isentropic wedge inlet given the design Mach number, leading edge and isentropic deflections, and the cowl and wave focus coordinates
KAY	Computes slope of line defining locus of intercepts of subcritical normal shock and capture streamline
LAGINT	Interpolation routine
LLT	Computes distance between two coord points
LININT	Computes the intercept of two straight lines each defined by 2 sets of coord points
MAAG2	Mass averages the fluid properties in a 2 region flow
MAAG3	Mass averages the fluid properties in a 3 region flow
MAAG4	Mass averages the fluid properties in a 4 region flow
MASAVG MAS100 MAS200 MAS300	Given an arbitrary 4 ramp configuration with a straight line perpendicular to one of the ramps, this series of subprograms solves the supersonic flow field, mass averages the supersonic properties at the station defined by the given straight line, and computes the flow properties downstream of a normal shock positioned at the given straight line
MCIRCL	Computes the Mach number corresponding to a given value of mass flow function, $\dot{m}$ and γ
MCPPT	Computes the supersonic Mach number corresponding to a given value of $\dot{m}\ P/P_t$ and γ
MCPPTS	Computes the subsonic Mach number corresponding to a given value of $\dot{m}\ P/P_t$ and γ
NUMACH	Computes the supersonic Mach number corresponding to a given value of Prandtl-Meyer angle and γ
OBSHOP	Computes static and total pressure ratios, static temperatue ratio, downstream Mach number and shock angle for both strong and weak oblique shocks for a given Mach number, deflection, and γ
OSSIE	Solves the flow field resulting from an opposite family shock-shock intercept

Subroutine Name	Subroutine Description
POLACK	Uses empirical and semi-empirical data to estimate the viscous losses in the supersonic diffuser and those associated with the terminal normal shock - boundary layer interaction
SDLOSS	Uses empirical data to estimate subsonic diffuser viscous losses
SHOPOL	Computes static and total pressure ratios, downstream Mach number and shock angle for both strong and weak oblique shocks for a given Mach number, deflection, and
SIDSPL	Computes the airflow and drag associated with lateral spillage of a two-dimensional supersonic inlet
SIPDRG	Computes sideplate lip and wave drag values
SLREST	Estimates a typical sideplate lip radius for a given design Mach number
SLVLI	Computes the intercept of a straight line defined by point-slope and a vertical line defined by its abscissa
SONOSH	Computes, for a given Mach number and , the shock angle and deflection corresponding to sonic flow downstream of a weak oblique shock
SPNS	Computes static and total pressure ratios, static temperature ratio, and downstream Mach number across a normal shock given upstream Mach number and
SSASOC	Answers questions (a) is supercritical operation theoretically possible and (b) will the inlet theoretically self-start
SSIS	Solves the flow field resulting from a same family shock-shock intercept
STORE	Stores values and "sets-up" arrays for subprogram INDRAG
STRACE	Computes the critical-supercritical airflow for a two-dimensional multi-ramp inlet below design Mach number
SWCONT	Computes the approximate airflow and drag attributable to small sidewall contractions for a two-dimensional supersonic multi-ramp inlet

Subroutine Name	Subroutine Description
TAR	Given a point, an angle, and a coord array, translates the point to the origin, translates the coord array to its corresponding position, and rotates same throught the given angle
THETAS	For given Mach number and $\gamma = 1.4$, computes the sin of the weak oblique shock wave angle for either sonic downstream conditions or detachment deflection
THICK	Computes necessary structural thickness for a maximum structural deflection at a single duct cross section
THRESH	Solves the flow field resulting from a three shock intersection composed of one strong oblique, one weak oblique, and a normal shock
TRACE	Computes airflow and critical additive drag for a supersonic, multi-ramp, two-dimensional inlet
TWOINT	Double interpolation routine
WDWT	Writes DUCFLO output for a shock-"lumped" expansion wave train computation
WSST	Writes DUCFLO output for a shock train computation
XBALL	Computes necessary structural thicknesses at a number of points along the sideplate and duct for a given maximum deflection for aluminum, titanium, Inconel, and stainless steel
XLAG	Given a straight line defined by a point-slope and a contour defined by a series of coord points, computes the intercept of the straight line with the contour and the contour slope at the intersection point
XSONDR	Uses empirical data to estimateinlet transonic drag
YAW	Dummy subroutine whic may be used to input empirical yaw performance corrections
ZZZZIP	Given an arbitrary 1, 2, or 3 ramp inlet with a straight line perpendicular to one of the ramps, this routine solves the supersonic flow field, mass averages the supersonic properties at the station defined by the given straight line, and computes the flow properties downstream of a normal shock positioned at the given straight line

7.7 "NWC" INLET DESIGN AND ANALYSIS PROGRAM FOR AXISYMMETRIC INLETS

Subroutine Name	Subroutine Description
ADG	Computes pertinent duct geometry parameters
AOTRIA	Computes internal angle of a triangle given the length of the three sides
ARCSIN	Given x, solves for the arc sin of same
ATHAXI	Computes the cowl lip plane area of an axisymmetric inlet
AXIGEO	Computes cowl lip plane area, throat area, subsonic diffuser area ratio and divergence angle and area ratios from the duct throat to the cowl lip plane and from the normal shock position to the duct throat
BLDDR	Uses empirical data to estimate boundary layer diverter drag
BLEED	Computes bleed/bypass airflow and drag
BMACH	Given Prandtl-Meyer angle, routine iteratively solves for corresponding supersonic Mach number
BODY	Solves for a body point using method of characteristics
CALC	Computes the mass averaged inlet plane properties and the inlet airflow and additive drag for 1, 2, or 3 cone inlets
CALSIS	Obtains a same-family shock-shock intercept solution referred to arbitrary reference conditions
CASMAX	Given a cone half angle, computes the free stream Mach numbers corresponding to sonic surface flow and shock detachment
CFLOW	Uses method of Taylor and Maccoll to solve conical supersonic flow field
CONFLW	For a given free stream Mach number and conical half angle, routine solves for the flow deflection over an attached weak oblique shock
COORDR	Gives the intercept of two straight lines each defined by a point and its slope in radians
CLWDAX	Computes cowl lip and wave drags for axisymmetric inlets
CNTRL1	Contains the driver logic for solution of the flow field on the external compression surface of an isentropic spike inlet using method of characteristics

Subroutine Name	Subroutine Description
CONFLO	Computes the conical field on the first cone of a 1, 2, or 3 cone inlet
CONVG	Iteratively solves for the intercept of a shock polar and the straight line representing an isentropic wave
COORD	Gives the intercept of two straight lines each defined by a point and slope
CWLCHK	Checks for the cowl forward of a two dimensional shock
DEFMAX	Computes shock detachment deflection for a given Mach number
DSXFLW	Computes approximate two-dimensional supersonic duct flow for shock-expansion train in the duct
DUCFLW	Computes approximate two-dimensional supersonic duct flow for (a) single shock train (b) double shock train
FACTOR	Calculates the interpolation factor for the field properties
FLENGT	Computes distance between two given coord points
FPS	Method of characteristics field point solution
GAOAS	Computes A/A* for given Mach number and γ
GASTAR	Computes A*/A for given Mach number and γ
GAMF	Given static temperature, computes corresponding γ (as presently written sets $\gamma = 1.4$)
GDEL	Computes deflection angle through weak oblique shock given Mach number, γ, and sin of the shock angle
GENRL	Solves for a field point using method of characteristics
GEXTH	Computes stream thrust/unit area given total pressure, Mach number and γ
GM2NS	Computes Mach number downstream of normal shock given upstream Mach number and γ
GM2OS	Computes Mach number downstream of weak oblique shock given upstream Mach number, shock angle and γ
GMDOT	Computes mass flow function, $\dot{m}$, for given Mach number and γ

Subroutine Name	Subroutine Description
GMP	Computes Mach number for given ratio of static to total pressure and γ
GMR	Computes Mach number for given ratio of static to total density and γ
GMT	Computes Mach number for given ratio of static to total temperature and γ
GPM	Computes Prandtl-Meyer angle for given Mach number and γ
GPNS	Computes static pressure ratio across normal shock for given Mach number and γ
GPOPT	Computes ratio of static to total pressure for given Mach number and γ
GPOS	Computes static pressure ratio across weak oblique shock given Mach number, shock angle, and γ
GPPTMC	Computes product of mass flow function and static to total pressure ratio, $\dot{m}\ P/P_t$, for given Mach number and γ
GPTNS	Computes total pressure ratio across a normal shock for given Mach number and γ
GPTOP	Computes ratio of total to static pressure for given Mach number and γ
GPTOS	Computes total pressure ratio across weak oblique shock given Mach number, shock angle, and γ
GQOP	Computes ratio of dynamic to static pressure for given Mach number and γ
GQOPT	Computes ratio of dynamic to total pressure for given Mach number and γ
GRNS	Computes static density ratio across a normal shock for given Mach number and γ
GRORT	Computes ratio of static to total density for given Mach number and γ
GROS	Computes static density ratio across a weak oblique shock given Mach number and γ

Subroutine Name	Subroutine Description
GSPSND	Computes speed of sound given static temperature and γ
GTNS	Computes static temperatue ratio across a normal shock given Mach number and γ
GTOS	Computes static temperatue ratio across a weak oblique shock given Mach number, shock angle, and γ
GTOTT	Computes ratio of static to total temperature given Mach number and γ
HEATF	Given static temperature, computes corresponding enthalpy
ILEARS	Solves the flow field resulting from the intercept of a "lumped" left running expansion and a right running shock
INTERI	Interpolation routine
INTERJ	Interpolation routine
IREALS	Solves the flow field resulting from the intercept of a "lumped" right running expansion and left running shock
LAGINT	Interpolation routine
LININT	Computes the intercept of two straight lines each defined by 2 sets of coord points
LLT	Computes distance between two coord points
MAAG2	Mass averages the fluid properties in a 2 region flow
MAAG3	Mass averages the fluid properties in a 3 region flow
MCIRCL	Computes the Mach number corresponding to a given value of mass flow function, $\dot{m}$, and γ
MCPPT	Computes the supersonic Mach number corresponding to a given value of $\dot{m}$ P/P_t and γ
MCPPTS	Computes the subsonic Mach number corresponding to a given value of m P/P_t and γ
NUMACH	Computes the supersonic Mach number corresponding to a given value of Prandtl-Meyer angle and γ
OBSHOP	Computes static and total pressure ratios, static temperature ratio, downstream Mach number and shock angle for both strong and weak oblique shocks for a given Mach number, deflection, and γ

Subroutine Name	Subroutine Description
OSSIE	Solves the flow field resulting from an opposite family shock-shock intercept
OSHAAD	Given an upstream Mach number, upstream total pressure, and downstrean total pressure the routine solves for the corresponding weak oblique shock wave angle and flow deflection
OUT	Computes mass averaged properties at the inlet plane, critical additive drag and capture
POLACK	Uses empirical and semi-empirical data to estimate the viscous losses in the supersonic diffuser and those associated with the terminal normal shock-boundar layer interaction
SDLOSS	Uses empirical data to estimate subsonic diffuser viscous losses
SHOPOL	Computes static and total pressure ratios, downstream Mach number and shock angle for both strong and weak oblique shocks for a given Mach number, deflection, and γ
SHOCK	Solves for a shock point using method of characteristics
SHXCHK	Check for shock ingestion
SIMQ	Solves a set of simultaneous linear algebraic equations
SLVI	Computes the intercept of a straight line defined by point-slope and a vertical line defined by its abscissa
SONOSH	Computes, for a given Mach number and γ , the shock angle and deflection corresponding to sonic flow downstream of a weak oblique shock
SPNS	Computes static and total pressure ratios, static temperatue ratio, and downstream Mach number across a normal shock given upstream Mach number and
SSASOC	Answers questions (a) is supercritical operation theoretically possible and (b) will the inlet theoretically self-start
SSIS	Solves the flow field resulting from a same family shock-shock intercept
TEMPF	Given enthalpy, computes corresponding static temperature

Subroutine Name	Subroutine Description
THETAS	For given Mach number and $\gamma = 1.4$, computes the sin of the weak oblique shock wave angle for either sonic downstream conditions or detachment deflection
TWOINT	Double interpolation routine
WDWT	Writes DSXFLW output for a shock-"lumped" expansion wave train computation
WRITE1	Handles output from method of characteristics computations
WSST	Writes DUCFLW output for a shock train computation
XLAG	Given a straight line defined by a point-slope and a contour defined by a series of coord points, computes the intercept of the straight line with the contour and the contour slope at the intersection point.

8.0 APPENDIX - TEST CASES

This section describes the inputs required to access the installation of the following propulsion systems:

- o a typical subsonic turbofan
- o a typical supersonic mixed-flow afterburning turbofan

The installation will include an engine weight breakdown and inlet and nozzle performance and drag. A podded nacelle configuration is assumed, therefore, inlet weight and nacelle weight and drag are included. Table XIX describes the inlet/engine/nozzle combinations of each test case.

Partial output will be included for all test cases; a full output will be included for the supersonic engine installed with the 'ASF' inlet, and the subsonic engine installed with the 'M9SUB' inlet.

Table XIX. Test Cases - Inlet/Engine/Nozzle Combinations

Engine Type	Inlet	Nozzle	C_{F_G}
Subsonic	M9SUB*		
Subsonic	Analytical		
Supersonic	ASF*	ADENAB*	ADENCFG*
Supersonic	FB*	ADENAB*	ADENCFG*
Supersonic	TM1B3*	DRP1*	CVRP*
Supersonic	AST*	DRP1*	CVRP*

*Database

8.1 SUBSONIC SHORT DUCT TURBOFAN

8.1.1 DATABASE INLET 'M9SUB'

```
 INSTAL & WATE-2 : TYPICAL SUBSONIC SEPERATE FLOW SHORT DUCT
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
INST=0,IFLGRF=0,IWT=1,
&END
NEP - INPUT
```

TABLE DATA INPUT SUMMARY 10 TABLES

TABLE NUMBER	REFERENCE NUMBER	ARRAY LOCATION
1	1001	1
2	1002	1075
3	1003	2147
4	1004	3223
5	1005	4459
6	1006	5695
7	1007	6931
8	1008	7384
9	1009	7978
10	1010	8431

DATA STORAGE ALLOCATION 20000
DATA STORAGE NOT USED 10828

```
&D MODE=1,INST=0,IFLGRF=0,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=1000,4*0,.97,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,1.4,1
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=6.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
18,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,9)='DUCT',10,0,12,0,SPEC(1,8)=.04,
KONFIG(1,13)='NOZZ',12,0,13,0,SPEC(1,13)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,8)='DUCT',5,0,11,0,SPEC(1,8)=.02,
KONFIG(1,14)='NOZZ',11,0,14,0,SPEC(1,14)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'STAP',8,11,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
NEP - INPUT
```

```
                                        1
                                      <INLT    1>
                                        2
                                      <COMP    2>
                                        3
                                      <SPLT    3>        <SPLT    3>
                                        4                   5
                 <COMP    4>          <COMP    4>        <DUCT    8>
                    7                   6                  11
                 <TURB    6>          <DUCT    5>        <NOZZ   14>
                                        8                  14
                 <TURB    7>          <TURB    6>
                                        9
                                      <TURB    7>
                                       10
                                      <DUCT    9>
                                       12
                                      <NOZZ   13>
                                       13
```

SHAFT (11) IS CONNECTED TO COMP(4) AND TURB(6) AND

SHAFT (12) IS CONNECTED TO COMP(2) AND TURB(7) AND

THE FOLLOWING REPRESENTS THE CONFIGURATION FOR MODE= 1
INSTAL & WATE-2 : TYPICAL SUBSONIC SEPERATE FLOW SHORT DUCT
CONFIGURATION DATA 14 STATIONS 29 COMPONENTS

COMPONENT NUMBER	NKIND	COMPONENT TYPE	UPSTREAM STATIONS		DOWNSTREAM STATIONS	
1	1	INLET	1	0	2	0
2	4	COMPRESR	2	0	3	0
3	7	SPLITTER	3	0	4	5
4	4	COMPRESR	4	0	6	7
5	2	DUCT B	6	0	8	0
6	5	TURBINE	8	7	9	0
7	5	TURBINE	9	7	10	0
8	2	DUCT B	5	0	11	0
9	2	DUCT B	10	0	12	0
11	11	SHAFT	4	6	0	0
12	11	SHAFT	2	7	0	0
13	9	NOZZLE	12	0	13	0
14	9	NOZZLE	11	0	14	0
15	12	CONTROL	12	0	7	0
16	12	CONTROL	9	0	6	0
17	12	CONTROL	8	0	4	0
18	12	CONTROL	11	0	3	0
19	12	CONTROL	4	0	2	0
20	12	CONTROL	2	0	1	0
21	12	CONTROL	2	0	5	0
24	14	LIMITER	0	0	4	0
28	12	CONTROL	11	0	11	0
29	12	CONTROL	12	0	12	0

CONTROL INFORMATION

```
15   VARY DATINP  1 OF COMPONENT  7 SO THAT STATP  8 OF FLOW STATION 12 EQUALS  0.0
16   VARY DATINP  1 OF COMPONENT  6 SO THAT STATP  8 OF FLOW STATION  9 EQUALS  0.0
17   VARY DATINP  1 OF COMPONENT  4 SO THAT STATP  8 OF FLOW STATION  8 EQUALS  0.0
18   VARY DATINP  1 OF COMPONENT  3 SO THAT STATP  8 OF FLOW STATION 11 EQUALS  0.0
19   VARY DATINP  1 OF COMPONENT  2 SO THAT STATP  8 OF FLOW STATION  4 EQUALS  0.0
20   VARY DATINP  1 OF COMPONENT  1 SO THAT STATP  8 OF FLOW STATION  2 EQUALS  0.0
21   VARY DATINP  4 OF COMPONENT  5 SO THAT DATOUT 6 OF COMPONENT  2 EQUALS  0.10000D+01
28   VARY DATINP  1 OF COMPONENT 11 SO THAT DATOUT 8 OF COMPONENT 11 EQUALS  0.0
29   VARY DATINP  1 OF COMPONENT 12 SO THAT DATOUT 8 OF COMPONENT 12 EQUALS  0.0
```

CASE IDENTIFICATION   INSTAL & WATE-2 : TYPICAL SUBSONIC SEPERATE FLOW SHORT DUCT

INPUT DATA

COMPONENT NO.	TYPE	DATINP1	DATINP2	DATINP3	DATINP4	DATINP5	DATINP6	DATINP7	DATINP8	DATINP9
1	INLET	0.10000D+04	0.0	0.0	0.0	0.0	0.97000D+00	0.0	0.0	0.0
2	COMPRESR	0.15000D+01	0.0	0.10000D+01	0.10010D+04	0.10000D+01	0.10020D+04	0.10000D+01	0.10030D+04	0.10000D+01
3	SPLITTER	0.60000D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	0.13000D+01	0.50000D-01	0.10000D+01	0.10040D+04	0.10000D+01	0.10050D+04	0.10000D+01	0.10060D+04	0.10000D+01
5	DUCT B	0.50000D-01	0.30000D+00	0.0	0.30000D+04	0.99000D+00	0.18300D+05	0.0	0.0	0.0
6	TURBINE	0.35000D+01	0.75000D+00	0.10000D+01	0.10070D+04	0.10000D+01	0.10080D+04	0.90000D+00	0.10000D+01	0.80000D+00
7	TURBINE	0.25000D+01	0.25000D+00	0.10000D+01	0.10090D+04	0.10000D+01	0.10100D+04	0.90000D+00	0.10000D+01	0.10000D+01
8	DUCT B	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	0.80000D+04	0.10000D+01	0.10000D+01	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.0
12	SHAFT	0.60000D+04	0.10000D+01	0.10000D+01	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.0
13	NOZZLE	0.0	0.98000D+00	0.0	0.0	0.97500D+00	0.10000D+01	0.0	0.0	0.10000D+01
14	NOZZLE	0.0	0.98000D+00	0.0	0.0	0.97500D+00	0.10000D+01	0.0	0.0	0.10000D+01
15	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
16	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
17	CONTROL	0.0	0.11000D+01	0.17500D+01	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
18	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
19	CONTROL	0.0	0.11000D+01	0.21000D+01	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
20	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
21	CONTROL	0.0	0.0	0.30000D+04	0.40000D+01	0.10000D+01	0.0	0.60000D+01	0.0	0.0
24	LIMITER	0.0	0.60000D+00	0.10500D+01	0.0	0.0	0.0	0.60000D+01	0.0	0.10000D+01
28	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.0	0.80000D+01	0.0	0.10000D+01
29	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.0	0.80000D+01	0.0	0.10000D+01

THE MAXIMUM COMPONENT NUMBER USED 29 DOES NOT EQUAL 23 THE NUMBER OF COMPONENTS CONFIGURED IN ANY ONE MODE - WARNING ONLY

MODE 1 NOW BEING USED
SUM OF (ERRORS**2)= 0.0

UPDATED INPUT DATA TO REFLECT CALCULATED INPUT

COMPONENT NO.	TYPE	DATINP1	DATINP2	DATINP3	DATINP4	DATINP5	DATINP6	DATINP7	DATINP8	DATINP9
1	INLET	0.10000D+04	0.0	0.14696D+02	0.0	0.0	0.97000D+00	0.0	0.0	0.0
2	COMPRESR	0.15000D+01	0.0	0.60000D+04	0.10010D+04	0.10466D+04	0.10020D+04	0.98277D+00	0.10030D+04	0.20121D+00
3	SPLITTER	0.60000D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	0.13000D+01	0.50000D-01	0.75645D+04	0.10040D+04	0.11076D+03	0.10050D+04	0.91142D+00	0.10060D+04	0.26168D+01
5	DUCT B	0.50000D-01	0.30000D+00	0.0	0.30000D+04	0.99000D+00	0.18300D+05	0.58081D+02	0.0	0.0
6	TURBINE	0.35000D+01	0.75000D+00	0.67327D+00	0.10070D+04	0.80078D+00	0.10080D+04	0.10204D+01	0.11132D+01	0.80000D+00
7	TURBINE	0.25000D+01	0.25000D+00	0.58279D+00	0.10090D+04	0.84282D+00	0.10100D+04	0.98318D+00	0.84810D+00	0.10000D+01
8	DUCT B	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	0.80000D+04	0.10000D+01	0.10000D+01	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.0
12	SHAFT	0.60000D+04	0.10000D+01	0.10000D+01	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.0
13	NOZZLE	0.34259D+03	0.98000D+00	0.0	0.0	0.97500D+00	0.10000D+01	0.0	0.0	0.10000D+01
14	NOZZLE	0.23942D+04	0.98000D+00	0.0	0.0	0.97500D+00	0.10000D+01	0.0	0.0	0.10000D+01

CASE IDENTIFICATION   INSTAL & WATE-2 : TYPICAL SUBSONIC SEPERATE FLOW SHORT DUCT

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.10000D+04	0.14696D+02	0.51867D+03	0.0	0.99998D+03	0.0	0.0	0.0
2	0.10000D+04	0.14255D+02	0.51867D+03	0.0	0.10309D+04	0.0	0.0	0.0
3	0.10000D+04	0.19957D+02	0.58012D+03	0.0	0.77876D+03	0.0	0.0	0.0
4	0.14286D+03	0.19558D+02	0.58012D+03	0.0	0.11352D+03	0.0	0.0	0.0
5	0.85714D+03	0.19558D+02	0.58012D+03	0.0	0.68113D+03	0.0	0.0	0.0
6	0.13571D+03	0.35204D+03	0.14081D+04	0.0	0.93346D+01	0.0	0.0	0.0
7	0.71429D+01	0.28682D+03	0.13288D+04	0.0	0.0	0.0	0.0	0.0
8	0.13923D+03	0.30824D+03	0.29293D+04	0.25928D-01	0.15775D+02	0.0	0.0	0.0
9	0.14459D+03	0.81480D+02	0.21990D+04	0.24944D-01	0.53697D+02	0.0	0.0	0.0
10	0.14638D+03	0.35861D+02	0.18408D+04	0.24632D-01	0.11301D+03	0.0	0.0	0.0
11	0.85714D+03	0.19167D+02	0.58012D+03	0.0	0.69503D+03	0.62707D+00	0.14696D+02	0.0
12	0.14638D+03	0.35861D+02	0.18408D+04	0.24632D-01	0.11301D+03	0.10000D+01	0.19382D+02	0.0
13	0.14638D+03	0.35861D+02	0.18408D+04	0.24632D-01	0.11301D+03	0.11926D+01	0.14696D+02	0.0
14	0.85714D+03	0.19167D+02	0.58012D+03	0.0	0.69503D+03	0.61140D+00	0.14696D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.0	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.97000D+00	0.10000D+01	0.0
2	COMPRESR	-0.20860D+05	0.60000D+04	0.0	0.15000D+01	0.34955D+01	0.10000D+01	0.10466D+04	0.85000D+00	0.14000D+01
3	SPLITTER	0.60000D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.41501D+05	0.80000D+04	0.0	0.13000D+01	0.31659D+02	0.10000D+01	0.11076D+03	0.86000D+00	0.18000D+02
5	DUCT B	0.78337D-01	0.50000D-01	0.30000D+00	0.27293D-01	0.58081D+02	0.12668D+05	0.30000D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.41501D+05	0.80000D+04	0.10000D+01	0.35000D+01	0.67327D+00	0.50000D+04	0.80078D+00	0.90000D+00	0.37830D+01
7	TURBINE	0.20860D+05	0.60000D+04	0.10000D+01	0.25000D+01	0.58279D+00	0.50000D+04	0.84282D+00	0.90000D+00	0.22721D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	0.0	0.80000D+04	0.80000D+04	0.80000D+04	0.0	0.0	0.0	0.0	0.0
12	SHAFT	0.0	0.60000D+04	0.60000D+04	0.60000D+04	0.0	0.0	0.0	0.0	0.0
13	NOZZLE	0.99814D+04	0.21940D+04	0.24402D+01	0.35265D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18502D+01	0.24402D+01
14	NOZZLE	0.18523D+05	0.69530D+03	0.13042D+01	0.23942D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18935D+01	0.13042D+01

MACH= 0.0   ALTITUDE= 0.   RECOVERY= 0.9700   0 ITERATIONS   2 PASSES

AIRFLOW (LB/SEC)	1000.00	GROSS THRUST	28504.76	FUEL FLOW (LB/HR)	12667.91
NET THRUST	28504.76	TSFC	0.4444	NET THRUST/AIRFLOW	28.5048
TOTAL INLET DRAG	0.0	TOTAL BRAKE SHAFT HP	0.0	BOATTAIL DRAG	0.0
INSTALLED THRUST	28504.76	INSTALLED TSFC	0.4444	SPILLAGE + LIP DRAG	0.0

```
&D ALTP=5000,MACH=.4,ETAR=.97,LABEL=T   &END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.31810D-01
SUM OF (ERRORS**2)= 0.21435D-01
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.98654D-02
SUM OF (ERRORS**2)= 0.17421D-02
SUM OF (ERRORS**2)= 0.12672D-02
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.47105D-02
SUM OF (ERRORS**2)= 0.42459D-04
SUM OF (ERRORS**2)= 0.23599D-05
SUM OF (ERRORS**2)= 0.11425D-06
```

CASE IDENTIFICATION SUBSONIC INLET

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.96869D+03	0.12228D+02	0.50084D+03	0.0	0.11440D+04	0.40000D+00	0.0	0.0
2	0.96866D+03	0.13247D+02	0.51689D+03	0.0	0.10728D+04	0.0	0.0	0.31520D-04
3	0.96866D+03	0.18078D+02	0.57495D+03	0.0	0.82903D+03	0.0	0.0	0.0
4	0.13043D+03	0.17717D+02	0.57495D+03	0.0	0.11391D+03	0.0	0.0	0.74645D-04
5	0.83822D+03	0.17717D+02	0.57495D+03	0.0	0.73203D+03	0.0	0.0	0.0
6	0.12390D+03	0.32149D+03	0.14023D+04	0.0	0.93126D+01	0.0	0.0	0.0
7	0.65213D+01	0.26184D+03	0.13230D+04	0.0	0.0	0.0	0.0	0.0
8	0.12713D+03	0.28142D+03	0.29290D+04	0.26018D-01	0.15776D+02	0.0	0.0	-0.84363D-06
9	0.13202D+03	0.74547D+02	0.21998D+04	0.25030D-01	0.53597D+02	0.0	0.0	-0.37512D-06
10	0.13365D+03	0.32743D+02	0.18407D+04	0.24717D-01	0.11300D+03	0.0	0.0	0.0
11	0.83808D+03	0.17363D+02	0.57495D+03	0.0	0.74697D+03	0.72463D+00	0.12228D+02	0.31769D-03
12	0.13365D+03	0.32743D+02	0.18407D+04	0.24717D-01	0.11300D+03	0.10000D+01	0.17697D+02	0.6[illegible]430D-06
13	0.13365D+03	0.32743D+02	0.18407D+04	0.24717D-01	0.11300D+03	0.12599D+01	0.12228D+02	0.0
14	0.83808D+03	0.17363D+02	0.57495D+03	0.0	0.74685D+03	0.70652D+00	0.12228D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.13212D+05	0.43884D+03	0.25999D+03	0.10320D+01	0.11168D+01	0.40000D+00	0.97000D+00	0.99657D+00	0.50000D+04
2	COMPRESR	-0.19091D+05	0.61718D+04	0.0	0.20519D+01	0.10052D+02	0.10304D+01	0.10466D+04	0.82552D+00	0.13648D+01
3	SPLITTER	0.64263D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.37836D+05	0.79904D+04	0.0	0.12965D+01	0.30881D+02	0.10033D+01	0.11076D+03	0.85722D+00	0.18146D+02
5	DUCT B	0.78577D-01	0.50000D-01	0.30000D+00	0.27387D-01	0.58081D+02	0.11605D+05	0.29921D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.37836D+05	0.79904D+04	0.10000D+01	0.34928D+01	0.67327D+00	0.49942D+04	0.80078D+00	0.89996D+00	0.37751D+01
7	TURBINE	0.19089D+05	0.61718D+04	0.10000D+01	0.25054D+01	0.58279D+00	0.51423D+04	0.84282D+00	0.89972D+00	0.22768D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	0.26223D-01	0.79904D+04	0.79904D+04	0.79904D+04	0.0	0.0	0.0	0.69309D-06	0.0
12	SHAFT	-0.15692D+01	0.61718D+04	0.61718D+04	0.61718D+04	0.0	0.0	0.0	-0.82199D-04	0.0
13	NOZZLE	0.95233D+04	0.22926D+04	0.26776D+01	0.36055D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18501D+01	0.26776D+01
14	NOZZLE	0.20588D+05	0.79037D+03	0.14199D+01	0.23942D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18935D+01	0.14199D+01

MACH= 0.4000 ALTITUDE= 5000. RECOVERY= 0.9700 8 ITERATIONS 25 PASSES

AIRFLOW (LB/SEC)	968.69	GROSS THRUST	30111.19	FUEL FLOW (LB/HR)	11605.39
NET THRUST	16898.72	TSFC	0.6868	NET THRUST/AIRFLOW	17.4449
TOTAL INLET DRAG	13212.47	TOTAL BRAKE SHAFT HP	-1.54	BOATTAIL DRAG	0.0
INSTALLED THRUST	16898.72	INSTALLED TSFC	0.6868	SPILLAGE + LIP DRAG	0.0

```
&D ALTP=15000,MACH=.6,ETAR=.97  &END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.64362D-01
SUM OF (ERRORS**2)= 0.16058D-01
SUM OF (ERRORS**2)= 0.26135D-03
SUM OF (ERRORS**2)= 0.87576D-04
SUM OF (ERRORS**2)= 0.25604D-04
SUM OF (ERRORS**2)= 0.10495D-04
SUM OF (ERRORS**2)= 0.44156D-05
SUM OF (ERRORS**2)= 0.20174D-05
SUM OF (ERRORS**2)= 0.95091D-06
```

CASE IDENTIFICATION CLIMB

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.78825D+03	0.82972D+01	0.46522D+03	0.0	0.13222D+04	0.60000D+00	0.0	0.0
2	0.78814D+03	0.10267D+02	0.49877D+03	0.0	0.11064D+04	0.0	0.0	0.13569D-03
3	0.78814D+03	0.13795D+02	0.55510D+03	0.0	0.86859D+03	0.0	0.0	0.0
4	0.10260D+03	0.13519D+02	0.55510D+03	0.0	0.11533D+03	0.0	0.0	-0.38145D-03
5	0.68558D+03	0.13519D+02	0.55510D+03	0.0	0.77099D+03	0.0	0.0	0.0
6	0.97468D+02	0.25310D+03	0.13821D+04	0.0	0.92385D+01	0.0	0.0	0.0
7	0.51299D+01	0.20585D+03	0.13029D+04	0.0	0.0	0.0	0.0	0.0
8	0.10003D+03	0.22134D+03	0.29283D+04	0.26323D-01	0.15781D+02	0.0	0.0	-0.12283D-04
9	0.10388D+03	0.58823D+02	0.22005D+04	0.25323D-01	0.53457D+02	0.0	0.0	0.75906D-06
10	0.10516D+03	0.25763D+02	0.18404D+04	0.25007D-01	0.11300D+03	0.0	0.0	0.0
11	0.68588D+03	0.13249D+02	0.55510D+03	0.0	0.78672D+03	0.84437D+00	0.82972D+01	-0.87769D-03
12	0.10516D+03	0.25763D+02	0.18404D+04	0.25007D-01	0.11300D+03	0.10000D+01	0.13926D+02	-0.24497D-05
13	0.10516D+03	0.25763D+02	0.18404D+04	0.25007D-01	0.11300D+03	0.13633D+01	0.82972D+01	0.0
14	0.68588D+03	0.13249D+02	0.55510D+03	0.0	0.78706D+03	0.82326D+00	0.82972D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.15543D+05	0.63441D+03	0.37585D+03	0.10721D+01	0.12757D+01	0.60000D+00	0.97000D+00	0.96163D+00	0.15000D+05
2	COMPRESR	-0.15062D+05	0.64045D+04	0.0	0.24611D+01	0.14965D+02	0.10885D+01	0.10466D+04	0.77854D+00	0.13436D+01
3	SPLITTER	0.66848D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.29693D+05	0.79522D+04	0.0	0.12827D+01	0.27778D+02	0.10162D+01	0.11076D+03	0.84329D+00	0.18722D+02
5	DUCT B	0.79430D-01	0.50000D-01	0.30000D+00	0.27708D-01	0.58081D+02	0.92363D+04	0.29654D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.29694D+05	0.79522D+04	0.10000D+01	0.34819D+01	0.67327D+00	0.49710D+04	0.80078D+00	0.89982D+00	0.37629D+01
7	TURBINE	0.15064D+05	0.64045D+04	0.10000D+01	0.25130D+01	0.58279D+00	0.53353D+04	0.84282D+00	0.89924D+00	0.22832D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	0.55792D+00	0.79522D+04	0.79522D+04	0.79522D+04	0.0	0.0	0.0	0.18789D-04	0.0
12	SHAFT	0.19145D+01	0.64045D+04	0.64045D+04	0.64045D+04	0.0	0.0	0.0	0.12710D-03	0.0
13	NOZZLE	0.79667D+04	0.24373D+04	0.31051D+01	0.37684D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18500D+01	0.31051D+01
14	NOZZLE	0.18972D+05	0.88997D+03	0.15968D+01	0.23942D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18936D+01	0.15968D+01

MACH= 0.6000 ALTITUDE= 15000. RECOVERY= 0.9700 8 ITERATIONS 17 PASSES

AIRFLOW (LB/SEC)	788.25	GROSS THRUST	26938.81	FUEL FLOW (LB/HR)	9236.30
NET THRUST	11395.95	TSFC	0.8105	NET THRUST/AIRFLOW	14.4573
TOTAL INLET DRAG	15542.86	TOTAL BRAKE SHAFT HP	2.47	BOATTAIL DRAG	0.0
INSTALLED THRUST	11395.95	INSTALLED TSFC	0.8105	SPILLAGE + LIP DRAG	0.0

LIMITER 19 VIOLATED *** VARIABLE VALUE IS 0.24611D+01 MAXIMUM ALLOWABLE VALUE IS 0.21000D+01

```
&D SPEC(4,5)=2460,ALTP=36000,MACH=.85,ETAR=.97, &END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.42915D+00
SUM OF (ERRORS**2)= 0.30523D+00
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.19910D+00
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.11338D+00
SUM OF (ERRORS**2)= 0.51334D-01
SUM OF (ERRORS**2)= 0.13909D-01
SUM OF (ERRORS**2)= 0.11633D-02
SUM OF (ERRORS**2)= 0.10234D-02
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.18399D-02
SUM OF (ERRORS**2)= 0.52357D-06
```

CASE IDENTIFICATION CRUISE

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.42095D+03	0.33065D+01	0.39051D+03	0.0	0.16234D+04	0.85000D+00	0.0	0.0
2	0.42117D+03	0.51440D+01	0.44707D+03	0.0	0.11165D+04	0.0	0.0	-0.52887D-03
3	0.42117D+03	0.68333D+01	0.49029D+03	0.0	0.88063D+03	0.0	0.0	0.0
4	0.51382D+02	0.66967D+01	0.49029D+03	0.0	0.10962D+03	0.0	0.0	-0.10252D-03
5	0.36979D+03	0.66967D+01	0.49029D+03	0.0	0.78899D+03	0.0	0.0	0.0
6	0.48813D+02	0.11377D+03	0.11688D+04	0.0	0.94651D+01	0.0	0.0	0.0
7	0.25691D+01	0.93019D+02	0.11031D+04	0.0	0.0	0.0	0.0	0.0
8	0.49781D+02	0.99660D+02	0.24018D+04	0.19860D-01	0.15797D+02	0.0	0.0	0.10183D-04
9	0.51708D+02	0.26558D+02	0.17862D+04	0.19106D-01	0.53097D+02	0.0	0.0	0.36974D-06
10	0.52350D+02	0.11414D+02	0.14762D+04	0.18867D-01	0.11371D+03	0.0	0.0	0.0
11	0.36981D+03	0.65627D+01	0.49029D+03	0.0	0.80509D+03	0.10000D+01	0.34655D+01	-0.11260D-03
12	0.52350D+02	0.11414D+02	0.14762D+04	0.18867D-01	0.11371D+03	0.10000D+01	0.61241D+01	-0.89421D-07
13	0.52350D+02	0.11414D+02	0.14762D+04	0.18867D-01	0.11371D+03	0.14285D+01	0.33065D+01	0.0
14	0.36981D+03	0.65627D+01	0.49029D+03	0.0	0.80514D+03	0.10137D+01	0.33065D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO. TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1 INLET	0.10773D+05	0.82343D+03	0.48783D+03	0.11448D+01	0.16039D+01	0.85000D+00	0.97000D+00	0.86196D+00	0.36000D+05
2 COMPRESR	-0.61675D+04	0.63029D+04	0.0	0.36821D+01	0.17321D+02	0.11315D+01	0.10466D+04	0.87575D+00	0.13284D+01
3 SPLITTER	0.71978D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4 COMPRESR	-0.12026D+05	0.71165D+04	0.0	0.13074D+01	0.35569D+02	0.96763D+00	0.11076D+03	0.87925D+00	0.16989D+02
5 DUCT B	0.77903D-01	0.50000D-01	0.30000D+00	0.20905D-01	0.58081D+02	0.34899D+04	0.30041D+00	0.99000D+00	0.24600D+04
6 TURBINE	0.12026D+05	0.71165D+04	0.10000D+01	0.34726D+01	0.67327D+00	0.49119D+04	0.80078D+00	0.89944D+00	0.37526D+01
7 TURBINE	0.61704D+04	0.63029D+04	0.10000D+01	0.25644D+01	0.58279D+00	0.58280D+04	0.84282D+00	0.89707D+00	0.23268D+01
8 DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9 DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11 SHAFT	-0.48528D-01	0.71165D+04	0.71165D+04	0.71165D+04	0.0	0.0	0.0	-0.40353D-05	0.0
12 SHAFT	0.28972D+01	0.63029D+04	0.63029D+04	0.63029D+04	0.0	0.0	0.0	0.46964D-03	0.0
13 NOZZLE	0.36779D+04	0.22604D+04	0.34520D+01	0.38898D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18638D+01	0.34520D+01
14 NOZZLE	0.11468D+05	0.99773D+03	0.19848D+01	0.23946D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18938D+01	0.19848D+01

MACH= 0.8500 ALTITUDE= 36000. RECOVERY= 0.9700 9 ITERATIONS 26 PASSES

AIRFLOW (LB/SEC)	420.95	GROSS THRUST	15145.99	FUEL FLOW (LB/HR)	3489.91
NET THRUST	4372.62	TSFC	0.7981	NET THRUST/AIRFLOW	10.3876
TOTAL INLET DRAG	10773.37	TOTAL BRAKE SHAFT HP	2.85	BOATTAIL DRAG	0.0
INSTALLED THRUST	4372.62	INSTALLED TSFC	0.7981	SPILLAGE + LIP DRAG	0.0

LIMITER 19 VIOLATED *** VARIABLE VALUE IS 0.36821D+01 MAXIMUM ALLOWABLE VALUE IS 0.21000D+01

```
&D IWT=2,NVOPT=0,DEBUG=0    &END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.52357D-06
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,9,13,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,9)='DUCT',1,4*0,
IWMEC(1,13)='NOZ ',1,-9,2,3*0,
IWMEC(1,8)='DUCT',1,4*0,
IWMEC(1,14)='NOZ ',1,-8,4*C,
IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.5,1.7,.40,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.44,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
```

```
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,9)=.50,0,0,-1,
DESVAL(1,13)=1.22,14*0.,
DESVAL(1,8)=.50,0,0,-1,
DESVAL(1,14)=.50,14*0.,
DESVAL(1,11)=50000.,.3,.85,4,6,
DESVAL(1,12)=50000.,.3,0,2,7,
&END
ATE2 - WTEST

************
*          *
*  FAN   2 *
*          *
***********2

MAX CONDITIONS OCCUR AT
****************************************
        ALT          MN        VALUE
PTOT       0.       0.0         14.3 LB/S^IN
TTOT       0.       0.0        518.7 DEG R
CWIN   36000.       0.850     1116.5 LB/SEC
****************************************
DUCT
 M NO   VEL   T TOT   P TOT    P STAT    AREA     GAM
0.500  545.   519.    2053.    1730.    27.9480  1.4005

 UTIPMAX STRESS      DEN   W/AREA    TR      H/T
 1215.6 26135.0    0.168   4.986   1.800   0.400

 COMPRESSOR  2 MECHANICAL DESIGN

 LOADING    N STG    DIAM  U TIP C     RPM    C RPM    MAX RPM
   0.957     1.00    78.10  1157.1   3395.4   3395.4   3566.8

 FRAME WT   =   468.14


 STAGE    1
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 223.  393.  393.    0.   82.   11.7 0.168 0.168   4.70
    PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR    WEIGHT  TIN    TMAX    STAGE I
 1.3990  14.7 0.500 27.948 15.62   39.05   73 1215.6 26135. 1090.   519.   519.    194937.

  N STG   WEIGHT   LENGTH   CENGRA   INERTIA
     1   1558.59    17.50      9.9   194937.1

 DUCT
  M NO   VEL   T TOT    P TOT    P STAT    AREA     GAM
 0.500  576.   580.     2874.    2423.    21.1190  1.3995

   PR      AD EF      PO      TO      HP
  1.4000  0.8500  2873.8   580.1  20858.
   HI       HO       WI      CWI
  123.95  138.70 1000.00 1030.93
```

```
****************** TOTAL COMP WEIGHT IS  1558.589

*************
*           *
*  HPC   4  *
*           *
************2

MAX CONDITIONS OCCUR AT
****************************************
      ALT        MN        VALUE
PTOT       0.      0.0       19.6 LB/SQIN
TTOT       0.      0.0      580.1 DEG R
CWIN       0.      0.0      113.5 LB/SEC
****************************************
DUCT
 M NO   VEL   T TOT   P TOT   P STAT   AREA     GAM
0.450  521.   580.   2816.   2451.    3.3286  1.3995

 UTIPMAX STRESS     DEN   W/AREA    TR     H/T
 1258.9 22391.1   0.168   0.930   1.200   0.700

 COMPRESSOR  4 MECHANICAL DESIGN

 LOADING   N STG   DIAM  U TIP C    RPM    C RPM   MAX RPM
   0.647   12.00   34.59  1190.4  8340.6  7886.6  8340.6

STAGE    1
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 63.   14.   14.   36.    8.    2.4 0.168 0.168   5.00
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
1ST STAGE   ATIO  IS 1.45 DES LIMIT IS 1.40
**STAGE ALL  BLE PRESSURE RATIO IS TOO HIGH REDUCE INPUT          **
1.4457  17.2 0.450  3.329 12.11  17.30 125 1258.9 22391.  134.  580.   580.     6773.

STAGE    2
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 63.    8.    8.   27.    6.    1.9 0.168 0.168   4.68
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I
1.3913  17.2 0.437  2.495 13.59  17.30 164 1258.9 16815.  111.  652.   652.     7250.

STAGE    3
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 53.    5.    5.   22.    5.    1.5 0.168 0.168   4.36
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I
1.3489  17.2 0.425  1.934 14.51  17.30 204 1258.9 13045.   91.  723.   723.     6749.

STAGE    4
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 43.    4.    4.   19.    4.    1.3 0.168 0.168   4.05
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I
1.3148  17.2 0.412  1.540 15.12  17.30 242 1258.9 10395.   74.  794.   794.     5829.

STAGE    5
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 35.    3.    3.   16.    3.    1.1 0.168 0.168   3.73
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I
```

```
1.2871  17.2 0.400  1.254 15.55  17.30 277 1258.9  8470.   61.  864.   864.     4936.

STAGE    6
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 29.    2.    2.   15.    3.    1.0 0.168 0.168   3.41
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I
1.2639  17.2 0.387  1.041 15.86  17.30 308 1258.9  7034.   51.  934.   934.     4240.

STAGE    7
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 25.    2.    2.   14.    3.    0.9 0.168 0.168   3.09
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.93 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT              **
1.2443  17.2 0.375  0.879 16.09  17.30 334 1258.9  5938.   45. 1004.  1004.     3755.

STAGE    8
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 23.    1.    1.   13.    3.    0.9 0.168 0.168   2.77
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.94 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT              **
1.2275  17.2 0.362  0.752 16.27  17.30 351 1258.9  5084.   42. 1072.  1072.     3442.

STAGE    9
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 22.    1.    1.   13.    3.    0.8 0.168 0.168   2.45
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.95 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT              **
1.2130  17.2 0.350  0.652 16.41  17.30 360 1258.9  4408.   39. 1141.  1141.     3261.

STAGE   10
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 38.    2.    2.   13.    3.    0.8 0.286 0.286   2.14
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.96 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT              **
1.2004  17.2 0.337  0.572 16.52  17.30 359 1258.9  6581.   57. 1208.  1208.     5654.

STAGE   11
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
 37.    2.    2.   13.    3.    0.9 0.286 0.286   1.82
  PR   DEL H  MACH   AREA   R HUB   R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.96 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT              **
1.1892  17.2 0.325  0.507 16.61  17.30 346 1258.9  5830.   56. 1275.  1275.     5532.

STAGE   12
  WD    WB    WS    WN    WC    CL    RHOB  RHOD    AR
```

ORIGINAL PAGE IS
OF POOR QUALITY

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 36.    2.    2.  14.    3.    1.0 0.286 0.286  1.50
  PR   DEL H  MACH  AREA  R HUB  R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I

**** WARNING FOLLOWING STAGE DESIGN LIMIT EXCEEDED *****
STAGE HUBTIP RATIO IS0.96 DES LIMIT IS0.93
**HUB TIP RATIO IS TOO HIGH REDUCE HUB TIP RATIO INPUT              **
1.1793  17.2 0.312  0.453 16.69  17.30 320 1258.9  5213.   57. 1342.  1342.     5521.

 N STG  WEIGHT  LENGTH  CENGRA  INERTIA
   12   817.32   14.43    7.9   62942.0

DUCT
 M NO   VEL  T TOT   P TOT   P STAT  AREA    GAM
0.312  561. 1408.  50694.  47475.    0.3962  1.3555

  PR     AD EF      PO      TO      HP
18.0000  0.8600 50694.4  1408.1  41704.
  HI      HO      WI     CWI
 138.70  345.03  142.86  113.52

****************** TOTAL COMP WEIGHT IS   817.321

************
*          *
*  PBUR  5 *
*          *
***********2

MAX CONDITIONS OCCUR AT
**************************************
       ALT          MN        VALUE
PTOT       0.      0.0         352.0 LB/SQIN
TTOT       0.      0.0        1408.1 DEG R
CWIN   36000.      0.850         9.5 LB/SEC
**************************************
BURNER NUMBER     5
  RIN     ROUT       LENGTH      MACH      WSPEC
 15.236   18.636    19.200     0.044     3.715
 CAS WT   LIN WT    NOZ WT    INC WT     FRAME     WTOT
   53.3     67.4      24.5      43.6     315.4     504.2


************
*          *
*  HPT   6 *
*          *
***********2

MAX CONDITIONS OCCUR AT
**************************************
       ALT          MN        VALUE
PTOT       0.      0.0         308.2 LB/SQIN
TTOT       0.      0.0        2929.3 DEG R
CWOUT      0.      0.0          53.7 LB/SEC
**************************************
DUCT
 M NO   VEL   T TOT   P TOT   P STAT  AREA    GAM
0.500 1250. 2929.  44387.  37894.    0.4434  1.2878
```

```
UTIPMAX STRESS     DEN   W/AREA    TR      H/T
1278.6  5743.4   0.286   0.168   1.000    0.967

TURBINE  6  MECHANICAL DESIGN
   H/T    N STG LOADING     AREA
 0.967   2.000   0.310    0.443
    UT     RTIP    RHUB    DEL H      RPM    MAXRPM  TORQ
1278.6     17.6    17.0    210.7  8340.6   8340.6 313594.

STAGE    1
 DISK    BLADE  VANE    HWD     CASE    AR
  17.6     2.5   10.1   62.3      6.5  1.00
  PR   DEL H  MACH   AREA   R HUB  R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
1.8785 105.3 0.500  0.443 16.98  17.57 281 1278.6   5743.    99.07     2.06      3269.

STAGE    2
 DISK    BLADE  VANE    HWD     CASE    AR
  29.9     6.1   24.4   87.2      9.3  1.20
  PR   DEL H  MACH   AREA   R HUB  R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
2.0592 105.3 0.525  0.754 16.98  17.97 205 1307.7   9765.   157.00     2.89      6076.

 N STG   LENGTH  WEIGHT    CENGRA   INERTIA
    2      4.96  256.07      3.8      9345.

DUCT
 M NO   VEL   T TOT    P TOT    P STAT   AREA     GAM
0.550 1202.  2232.   11460.    9451.    1.3955  1.3035

  PR        TR       AD EF     PO        TO        TO.1
 3.8731   1.3137   0.9000 11460.3   2229.8    2232.0
 H IN     H OUT     AREA    FLOW      HP
 797.42   586.75     5.75   139.23   41501.

****************** TOTAL TURB WEIGHT IS   256.070


************
*          *
*  LPT   7 *
*          *
***********2

MAX CONDITIONS OCCUR AT
*************************************
       ALT          MN         VALUE
PTOT       0.       0.0          81.5 LB/SQIN
TTOT       0.       0.0        2199.0 DEG R
CWOUT 36000.        0.850       113.7 LB/SEC
*************************************
DUCT
 M NO   VEL   T TOT    P TOT    P STAT   AREA     GAM
0.550 1193.  2199.   11733.    9675.    1.4045  1.3045

 UTIPMAX STRESS     DEN   W/AREA    TR      H/T
  561.7  3327.4   0.286   0.538   1.000    0.896

 TURBINE  7  MECHANICAL DESIGN
   H/T    N STG LOADING     AREA
 0.896   5.000   0.280    1.405
    UT     RTIP    RHUB    DEL H      RPM    MAXRPM  TORQ
```

```
  534.7     18.0     16.2    102.0   3395.4   3566.8 368594.

 STAGE     1
  DISK    BLADE  VANE    HWD     CASE    AR
    8.8    16.7   66.9    90.3    10.7  2.00
   PR   DEL H  MACH   AREA   R HUB  R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
1.1669  20.4 0.550  1.405 16.16  18.04 180  561.7   3327.  193.42    3.30      5539.

 STAGE     2
  DISK    BLADE  VANE    HWD     CASE    AR
   10.0    19.1   76.3    90.4    10.9  2.25
   PR   DEL H  MACH   AREA   R HUB  R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
1.1729  20.4 0.560  1.593 16.16  18.28 182  569.1   3773.  206.61    3.31      6318.

 STAGE     3
  DISK    BLADE  VANE    HWD     CASE    AR
   11.4    22.3   89.3    91.9    11.2  2.50
   PR   DEL H  MACH   AREA   R HUB  R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
1.1794  20.4 0.570  1.815 16.16  18.56 182  577.7   4299.  226.15    3.36      7361.

 STAGE     4
  DISK    BLADE  VANE    HWD     CASE    AR
   13.0    26.7  106.7    94.8    11.8  2.75
   PR   DEL H  MACH   AREA   R HUB  R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
1.1865  20.4 0.580  2.079 16.16  18.88 180  587.7   4924.  253.00    3.47      8735.

 STAGE     5
  DISK    BLADE  VANE    HWD     CASE    AR
   15.0    32.2  129.0    99.1    12.5  3.00
   PR   DEL H  MACH   AREA   R HUB  R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
1.1942  20.4 0.590  2.394 16.16  19.26 175  599.5   5672.  287.82    3.62     10486.

 FRAME WT  =  301.69

  N STG   LENGTH  WEIGHT   CENGRA  INERTIA
    5     20.48 1468.69    12.8    38439.

 DUCT
  M NO   VEL   T TOT   P TOT   P STAT  AREA    GAM
 0.600 1192. 1847.   5127.   4072.   2.7759  1.3171

   PR      TR      AD EF    PO      TO      TO.1
  2.2884  1.1908  0.9000  5127.2  1846.7  1847.2
  H IN    H OUT    AREA   FLOW     HP
  577.05  475.08   19.52  144.59  20860.
 ****************** TOTAL TURB WEIGHT IS  1468.689


 *************
 *           *
 *  DUCT   9 *
 *           *
 ************2

 MAX CONDITIONS OCCUR AT
 **********************
       ALT         MN
```

```
PTOT       0.      0.0
TTOT       0.      0.0
**********************

************
*          *
*  NOZ  13  *
*          *
***********2

MAX CONDITIONS OCCUR AT
**********************
      ALT          MN
PTOT       0.      0.0
TTOT       0.      0.0
**********************
NOZZLE   13
WEIGHT=   168.51 LENGTH=   48.087 TR WT=  294.34

************
*          *
*  DUCT  8  *
*          *
***********2

MAX CONDITIONS OCCUR AT
**********************
      ALT          MN
PTOT       0.      0.0
TTOT       0.      0.0
**********************

************
*          *
*  NOZ  14  *
*          *
***********2

MAX CONDITIONS OCCUR AT
**********************
      ALT          MN
PTOT       0.      0.0
TTOT       0.      0.0
**********************
NOZZLE   14
WEIGHT=   148.65 LENGTH=   37.526 TR WT=    0.0

************
*          *
*  SHAF 12  *
*          *
***********2

MAX TORQUE CONDITION
**********************
 TORQUE
 3.5
**********************
```

```
SHAFT  12
   DO      DI    LENG      DN     WT
  4.81    0.0    38.59   0.44  210.72


TOTAL INERTIA OF THIS SPOOL IS     38443.

*************
*           *
*  SHAF 11  *
*           *
************2

MAX TORQUE CONDITION
***********************
 TORQUE
 5.2
***********************
SHAFT  11
   DO      DI    LENG      DN     WT
  5.98    5.21   19.20    1.27   38.34


TOTAL INERTIA OF THIS SPOOL IS     72290.

*************
*           *
*  ACCS WT  *
*           *
************2

  ACCS WT=   0.000
```

WEIGHT INPUT DATA IN ENGL UNITS
WEIGHT OUTPUT DATA IN ENGL UNITS

COMP	WT	COMP	ACCU	UPSTREAM RADIUS				DOWNSTREAM RADIUS				
NO	EST	LEN	LEN	RI	RO	RI	RO	RI	RO	RI	RO	NSTAGE
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0
2	1559.	17.	17.	16.	39.	0.	0.	19.	38.	0.	0.	1
3	0.	0.	17.	0.	0.	0.	0.	19.	23.	23.	38.	0
4	817.	14.	32.	12.	17.	0.	0.	17.	17.	0.	0.	12
5	504.	19.	51.	15.	19.	0.	0.	15.	19.	0.	0.	0
6	256.	5.	56.	17.	18.	0.	0.	17.	19.	0.	0.	2
7	1469.	20.	77.	16.	18.	0.	0.	16.	20.	0.	0.	5
8	0.	0.	17.	23.	38.	0.	0.	23.	38.	0.	0.	0
9	0.	0.	77.	16.	20.	0.	0.	16.	20.	0.	0.	0
11	39.	0.	0.	12.	17.	15.	19.	0.	0.	0.	0.	0
12	211.	0.	0.	16.	39.	0.	0.	0.	0.	0.	0.	0
13	463.	48.	125.	0.	20.	0.	0.	0.	18.	0.	0.	0
14	149.	38.	55.	0.	38.	0.	0.	0.	36.	0.	0.	0

TOTAL BARE ENGINE WEIGHT= 5466. ACCESSORIES= 0.00 ESTIMATED TOTAL LENGTH= 125. ESTIMATED MAXIMUM RADIUS= 39.
ESTIMATED CENTER OF GRAVITY= 41.

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```
CCCCCCC
C      CCCCCCCCCCNNNNNNNNNNNNNNNN
C                C               NNNNNNNNNNNNNNNNNNNNNNNN
C                C
C                C
C                C
C                C
C                C
C                C
C                C
C                D
C                C
C                C                                       TTTTTTNNNNNNNNNNNNNN
C         CCCCCCCC                   PPPPPPPPPPPPPPPPTTTTTTTTTTTTTTTTTTTT      T             NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
CCCCCCCCCC       CCCCCCCCCCCCCCCPPPPPPPPPPP         TTTTTTTTTTTTTTTTTTTTTTTTTTTD
C                C       CCCCC                 PPPPPPPPPP
                 C  CCCCC
                 CCC

-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L --------
```

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.42095D+03	0.33065D+01	0.39051D+03	0.0	0.16234D+04	0.85000D+00	0.0	0.0
2	0.42117D+03	0.51440D+01	0.44707D+03	0.0	0.11165D+04	0.0	0.0	-0.52887D-03
3	0.42117D+03	0.68333D+01	0.49029D+03	0.0	0.88063D+03	0.0	0.0	0.0
4	0.51382D+02	0.66967D+01	0.49029D+03	0.0	0.10962D+03	0.0	0.0	-0.10252D-03
5	0.36979D+03	0.66967D+01	0.49029D+03	0.0	0.78899D+03	0.0	0.0	0.0
6	0.48813D+02	0.11377D+03	0.11688D+04	0.0	0.94651D+01	0.0	0.0	0.0
7	0.25691D+01	0.93019D+02	0.11031D+04	0.0	0.0	0.0	0.0	0.0
8	0.49781D+02	0.99660D+02	0.24018D+04	0.19860D-01	0.15797D+02	0.0	0.0	0.10183D-04
9	0.51708D+02	0.26558D+02	0.17862D+04	0.19106D-01	0.53097D+02	0.0	0.0	0.36974D-06
10	0.52350D+02	0.11414D+02	0.14762D+04	0.18867D-01	0.11371D+03	0.0	0.0	0.0
11	0.36981D+03	0.65627D+01	0.49029D+03	0.0	0.80509D+03	0.10000D+01	0.34655D+01	-0.11260D-03
12	0.52350D+02	0.11414D+02	0.14762D+04	0.18867D-01	0.11371D+03	0.10000D+01	0.61241D+01	-0.89421D-07
13	0.52350D+02	0.11414D+02	0.14762D+04	0.18867D-01	0.11371D+03	0.14285D+01	0.33065D+01	0.0
14	0.36981D+03	0.65627D+01	0.49029D+03	0.0	0.80514D+03	0.10137D+01	0.33065D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.10773D+05	0.82343D+03	0.48783D+03	0.11448D+01	0.16039D+01	0.85000D+00	0.97000D+00	0.86196D+00	0.36000D+05
2	COMPRESR	-0.61675D+04	0.63029D+04	0.0	0.36821D+01	0.17321D+02	0.11315D+01	0.10466D+04	0.87575D+00	0.13284D+01
3	SPLITTER	0.71978D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.12026D+05	0.71165D+04	0.0	0.13074D+01	0.35569D+02	0.96763D+00	0.11076D+03	0.87925D+00	0.16989D+02
5	DUCT B	0.77903D-01	0.50000D-01	0.30000D+00	0.20905D-01	0.58081D+02	0.34899D+04	0.30041D+00	0.99000D+00	0.24600D+04
6	TURBINE	0.12026D+05	0.71165D+04	0.10000D+01	0.34726D+01	0.67327D+00	0.49119D+04	0.80078D+00	0.89944D+00	0.37526D+01
7	TURBINE	0.61704D+04	0.63029D+04	0.10000D+01	0.25644D+01	0.58279D+00	0.58280D+04	0.84282D+00	0.89707D+00	0.23268D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	-0.48528D-01	0.71165D+04	0.71165D+04	0.71165D+04	0.0	0.0	0.0	-0.40353D-05	0.0
12	SHAFT	0.28972D+01	0.63029D+04	0.63029D+04	0.63029D+04	0.0	0.0	0.0	0.46964D-03	0.0
13	NOZZLE	0.36779D+04	0.22604D+04	0.34520D+01	0.38898D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18638D+01	0.34520D+01
14	NOZZLE	0.11468D+05	0.99773D+03	0.19848D+01	0.23946D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18938D+01	0.19848D+01

MACH= 0.8500 ALTITUDE= 36000. RECOVERY= 0.9700 0 ITERATIONS 1 PASSES

AIRFLOW (LB/SEC)	420.95	GROSS THRUST	15145.99	FUEL FLOW (LB/HR)	3489.91
NET THRUST	4372.62	TSFC	0.7981	NET THRUST/AIRFLOW	10.3876
TOTAL INLET DRAG	10773.37	TOTAL BRAKE SHAFT HP	2.85	BOATTAIL DRAG	0.0
INSTALLED THRUST	4372.62	INSTALLED TSFC	0.7981	SPILLAGE + LIP DRAG	0.0

LIMITER 19 VIOLATED *** VARIABLE VALUE IS 0.36821D+01 MAXIMUM ALLOWABLE VALUE IS 0.21000D+01

```
&D
IWT=0,INST=1,IFLGRF=0,ALTP=5000,MACH=.4,LABEL=F,
&END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.27817D+01
SUM OF (ERRORS**2)= 0.15598D+01
SUM OF (ERRORS**2)= 0.91332D+00
SUM OF (ERRORS**2)= 0.47090D+00
SUM OF (ERRORS**2)= 0.27004D+00
SUM OF (ERRORS**2)= 0.21625D+00
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.14241D+00
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.80739D-01
SUM OF (ERRORS**2)= 0.42073D-01
SUM OF (ERRORS**2)= 0.21985D-01
SUM OF (ERRORS**2)= 0.11808D-01
SUM OF (ERRORS**2)= 0.64913D-02
SUM OF (ERRORS**2)= 0.36183D-02
SUM OF (ERRORS**2)= 0.20348D-02
SUM OF (ERRORS**2)= 0.11513D-02
SUM OF (ERRORS**2)= 0.65436D-03
SUM OF (ERRORS**2)= 0.37306D-03
SUM OF (ERRORS**2)= 0.21296D-03
SUM OF (ERRORS**2)= 0.12166D-03
SUM OF (ERRORS**2)= 0.69540D-04
SUM OF (ERRORS**2)= 0.39771D-04
SUM OF (ERRORS**2)= 0.22755D-04
SUM OF (ERRORS**2)= 0.13024D-04
SUM OF (ERRORS**2)= 0.74563D-05
SUM OF (ERRORS**2)= 0.42698D-05
SUM OF (ERRORS**2)= 0.24453D-05
SUM OF (ERRORS**2)= 0.14005D-05
SUM OF (ERRORS**2)= 0.80212D-06
&I
INMAP='M9SUB',NOZMAP=0,CFGMAP=0,DCDMAP=0,
DERP=0,ACI=37.,NWC=1,NWD=1,INLTWT=1,INOZ(1)=0,0,13,14,KVALUE=.00025,
ENGNO=1,TABRF=0.,ICFCN=2,
REFMFR=0.,OPTB=3.,A10A9R=2.1,SCALE=1.,
PRINT=1.,UNITI=1.,UNITO=1.,MODE=0,STOP=0,
&END
INSTAL - INSTLL
 1
SUM OF (ERRORS**2)= 0.80212D-06
```

OLD INSTALLATION MAPS

****
* TABLE 1 *
****

LOCAL MACH NUMBER (MNO) VS FREE STREAM MACH NUMBER (MNFS)

0.0	0.200	1.000	MNO
0.0	0.200	1.000	MNFS

****
* TABLE 2A *
****

INLET PRESSURE RECOVERY (PT2/PT0) VS MASS FLOW RATIO (AO/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.200	1.500	1.800	2.000	2.100	2.200	AO/AC		
	0.995	0.994	0.993	0.992	0.990	PT2/PT0		
MNO=0.300	1.000	1.200	1.400	1.600	AO/AC			
	0.997	0.995	0.992	0.989	PT2/PT0			
MNO=0.400	0.400	0.600	0.800	0.890	0.950	1.100	1.200	AO/AC
	1.000	1.000	0.999	0.998	0.996	0.993	0.989	PT2/PT0
MNO=0.500	0.400	0.600	0.700	0.800	0.900	0.960	1.000	AO/AC
	1.000	1.000	0.999	0.998	0.996	0.993	0.990	PT2/PT0
MNO=0.600	0.400	0.570	0.600	0.700	0.800	0.880	0.900	AO/AC
	1.000	0.999	0.999	0.999	0.998	0.995	0.989	PT2/PT0
MNO=0.700	0.400	0.500	0.570	0.700	0.800	0.850	AO/AC	
	1.000	0.999	0.999	0.998	0.997	0.995	PT2/PT0	
MNO=0.800	0.400	0.500	0.570	0.700	0.800	0.850	AO/AC	
	1.000	0.999	0.999	0.998	0.997	0.995	PT2/PT0	
MNO=0.900	0.400	0.500	0.570	0.700	0.800	0.850	AO/AC	
	1.000	0.999	0.999	0.998	0.997	0.995	PT2/PT0	

****
* TABLE 2B *
****

OPTIMUM INLET RECOVERY (PT2/PT0 OPT) VS LOCAL MACH NUMBER (MNO)

0.0	0.025	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.900	MNO
0.993	0.996	0.995	0.993	0.992	0.998	0.998	0.997	0.997	0.997	PT2/PT0

```
************
* TABLE 2C *
************
```

OPTIMUM MASS FLOW RATIO (AO/AC OPT) VS LOCAL MACH NUMBER (MNO)

0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900	MNO
2.070	1.400	0.890	0.850	0.820	0.770	0.770	0.770	AO/AC

```
************
* TABLE 2D *
************
```

BUZZ LIMIT MASS FLOW RATIO (AO/AC) VS LOCA. MACH NUMBER (MNO)

0.0	0.500	1.000	MNO
0.0	0.0	0.0	AO/AC

```
************
* TABLE 2E *
************
```

DISTORTION LIMIT MASS FLOW RATIO (AO/AC) VS LOCAL MACH NUMBER (MNO)

0.200	0.300	0.400	0.500	0.600	0.700	0.900	MNO
2.200	1.600	1.200	1.050	0.900	0.900	0.900	AO/AC


```
************
* TABLE 3  *
************
```

SPILLAGE DRAG COEFFICIENT (CDSPL) VS INLET MASS FLOW RATIO (AOI/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.0	0.0	2.500	AOI/AC					
	0.0	0.0	CDSPL					
MNO=0.700	0.400	0.500	0.600	0.655	2.500	AOI/AC		
	0.006	0.005	0.002	0.0	0.0	CDSPL		
MNO=0.800	0.400	0.500	0.600	0.700	0.770	0.785	2.500	AOI/AC
	0.009	0.007	0.005	0.003	0.001	0.0	0.0	CDSPL
MNO=0.850	0.400	0.500	0.600	0.700	0.750	0.785	2.500	AOI/AC
	0.011	0.009	0.007	0.004	0.002	0.0	0.0	CDSPL
MNO=0.900	0.400	0.500	0.600	0.700	0.750	0.785	2.500	AOI/AC
	0.017	0.015	0.012	0.007	0.003	0.0	0.0	CDSPL

```
************
* TABLE 3A *        REF SPILLAGE DRAG COEFF (REF CDSPL)        VS        LOCAL MACH NUMBER (MNO)
************

              0.0       1.000      MNO
              0.0       0.0        REF CDSPL


************
* TABLE 3B *        REF INLET MASS FLOW RATIO (REF AOI/AC)     VS        LOCAL MACH NUMBER (MNO)
************

              0.0       1.000      MNO
              0.0       0.0        REF AOI/AC


************
* TABLE 4  *    BLEED DRAG COEFFICIENT (CD BLD)      VS     BLEED MASS FLOW RATIO (AOBLD/AC)     AND     LOCAL MACH NUMBER (MNO)
************

              0.0       9.000      MNO

MNO=0.0       0.0       4.000      AOBLD/AC
              0.0       0.0        CDBLD

MNO=9.000     0.0       4.000      AOBLD/AC
              0.0       0.0        CDBLD
```



```
************
* TABLE 5  *    BYPASS DRAG COEFFICIENT (CDBYP)      VS    BYPASS MASS FLOW RATIO (AOBYP/AC)     AND     LOCAL MACH NUMBER (MNO)
************

              0.0       9.000      MNO

MNO=0.0       0.0       4.000      AOBYP/AC
              0.0       0.0        CDBYP

MNO=9.000     0.0       4.000      AOBYP/AC
              0.0       0.0        CDBYP


************
* TABLE 6A *    BLEED MASS FLOW RATIO (AOBLD/AC)     VS       MASS FLOW RATIO (AO/AC)          AND     LOCAL MACH NUMBER (MNO)
************
```

```
MNO=0.0        0.0        1.000      AO/AC
               0.0        0.0        AOBLD/AC

MNO=1.000      0.0        1.000      AO/AC
               0.0        0.0        AOBLD/AC


************
* TABLE 6B *          OPTIMUM BLEED MASS FLOW RATIO (AOBLD/AC)    VS       LOCAL MACH NUMBER (MNO)
************

               0.0        1.000      MNO
               0.0        0.0        AOBLD/AC


************
* TABLE 7  *   BYPASS MASS FLOW RATIO (AOBYP/AC)      VS      ENGINE MASS FLOW RATIO (AOE/AC)     AND     LOCAL MACH NUMBER (MNO)
************

MNO=0.0        0.0        1.000      AOE/AC
               0.0        0.0        AOBYP/AC

MNO=1.000      0.0        1.000      AOE/AC
               0.0        0.0        AOBYP/AC


INLET START MACH NUMBER 3.000

MINIMUM MACH NUMBER FOR INLET DRAG CALCULATIONS  0.200
```

```
SUM OF (ERRORS**2)= 0.80212D-06
M9SUB     0
&WET
ITERFP(1)=1,2,3,8,14,0,
ISECFP(1)=1,2,3,4,5,6,7,9,13,0,
RLFDC=.54,ICCOMP=7,IFCOMP=14,CLMIN=4.,
&END
ETTED AREA - NACWET
&INLWT
SLST=28500.,INLET=4,QMAX=300.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
NLET WEIGHT - INLWT
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
M9SUB				21 NOV 79

ALTITUDE	MACH NUMBER
5000.0 FT	0.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1760.15 LBS/FT**2	1965.29 LBS/FT**2	500.86 DEG R	516.89 DEG R	197.14 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
37.00 FT**2	2.10	40 44 FT**2	19.26 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	11411.543
WFT (LBM/HR)	6966.336
SFC (LBM/HR/LBF)	0.610
W2 COR (LBM/SEC)	943.945
W2 ABS (LBM/SEC)	888.912
RF	0.999
CFG (PRI)	0.975
CGF (SEC)	0.975

INLET MASS FLOW RATIOS

AOSPL/AC	0.180
AOI/AC	0.820
AOBLD/AC	0.0
AO/AC	0.820
AOBYP/AC	0.0
AOE/AC	0.820

INLET DRAG

AC (FT**2)	37.000
CD SPL (TAB 3)	0.0
CD SPL (TAB 3A)	0.0
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.0
DRAG INL TOT (LBF)	0.0
CD INL REF	0.0
DRAG INL REF (LBF)	0.0
CD INL PS	0.0
DRAG INL PS (LBF)	0.0

AFTBODY DRAG

A10/A9	0.0
A10 (FT**2)	40.436
A9 (FT**2)	0.0
P9S/PAMB	0.0
CD A/B	0.0
DRAG A/B (LBF)	0.0
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.0
DRAG A/B TOT (LBF)	0.0
CD A/B REF	0.0
DRAG A/B REF (LBF)	0.0
CD A/B PS	0.0
DRAG A/B PS (LBF)	0.0

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	11411.543
WFT (LBM/HR)	6966.336
SFC (LBM/HR/LBF)	0.610
FN COR (LBF)	13720.082
WFT COR (LBM/HR)	8523.402
SFC COR (LBM/HR/LBF)	0.621

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	85.
FIREWALL (LBM) =	130.
COWL (LBM) =	618.
TOTAL (LBM) =	834.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	273.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	0.
I/O DOORS (LBM) =	0.
TOTAL (LBM) =	273.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	5466.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	5466.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	91.4
FORM (LBF) =	7.8
TOTAL (LBF) =	99.2

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.88891D+03	0.12228D+02	0.50084D+03	0.0	0.10498D+04	0.40000D+00	0.0	0.0
2	0.88898D+03	0.13639D+02	0.51689D+03	0.0	0.95617D+03	0.0	0.0	-0.71614D-04
3	0.88898D+03	0.17226D+02	0.55938D+03	0.0	0.78760D+03	0.0	0.0	0.0
4	0.10807D+03	0.16882D+02	0.55938D+03	0.0	0.97700D+02	0.0	0.0	-0.14209D-04
5	0.78091D+03	0.16882D+02	0.55938D+03	0.0	0.70597D+03	0.0	0.0	0.0
6	0.10267D+03	0.23810D+03	0.12390D+04	0.0	0.97939D+01	0.0	0.0	0.0
7	0.54036D+01	0.19637D+03	0.11733D+04	0.0	0.0	0.0	0.0	0.0
8	0.10460D+03	0.20936D+03	0.24046D+04	0.18848D-01	0.15810D+02	0.0	0.0	0.21313D-05
9	0.10866D+03	0.55155D+02	0.17851D+04	0.18132D-01	0.53709D+02	0.0	0.0	0.76006D-07
10	0.11001D+03	0.24001D+02	0.14787D+04	0.17906D-01	0.11373D+03	0.0	0.0	0.0
11	0.78072D+03	0.16544D+02	0.55938D+03	0.0	0.72038D+03	0.67047D+00	0.12228D+02	0.44638D-03
12	0.11001D+03	0.24001D+02	0.14787D+04	0.17906D-01	0.11373D+03	0.10000D+01	0.12876D+02	0.12804D-04
13	0.11001D+03	0.24001D+02	0.14787D+04	0.17906D-01	0.11373D+03	0.10177D+01	0.12228D+02	0.0
14	0.78072D+03	0.16544D+02	0.55938D+03	0.0	0.72021D+03	0.65371D+00	0.12228D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.12124D+05	0.43884D+03	0.25999D+03	0.10320D+01	0.11168D+01	0.40000D+00	0.99870D+00	0.99657D+00	0.50000D+04
2	COMPRESR	-0.12820D+05	0.54155D+04	0.0	0.19899D+01	0.12447D+02	0.90413D+00	0.10466D+04	0.83760D+00	0.12630D+01
3	SPLITTER	0.72259D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25495D+05	0.70742D+04	0.0	0.13256D+01	0.39939D+02	0.90051D+00	0.11076D+03	0.90103D+00	0.14104D+02
5	DUCT B	0.74432D-01	0.50000D-01	0.30000D+00	0.19840D-01	0.58081D+02	0.69663D+04	0.31219D+00	0.99000D+00	0.24600D+04
6	TURBINE	0.25495D+05	0.70742D+04	0.10000D+01	0.35115D+01	0.67327D+00	0.48799D+04	0.80078D+00	0.89927D+00	0.37958D+01
7	TURBINE	0.12833D+05	0.54155D+04	0.10000D+01	0.25305D+01	0.58279D+00	0.50089D+04	0.84282D+00	0.90005D+00	0.22980D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	-0.90721D-02	0.70742D+04	0.70742D+04	0.70742D+04	0.0	0.0	0.0	-0.35584D-06	0.0
12	SHAFT	0.12478D+02	0.54155D+04	0.54155D+04	0.54155D+04	0.0	0.0	0.0	0.97279D-03	0.0
13	NOZZLE	0.59127D+04	0.17293D+04	0.19628D+01	0.34268D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18641D+01	0.19628D+01
14	NOZZLE	0.17623D+05	0.72627D+03	0.13529D+01	0.23942D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18936D+01	0.13529D+01

MACH= 0.4000   ALTITUDE= 5000.   RECOVERY= 0.9987   6 ITERATIONS   7 PASSES

AIRFLOW (LB/SEC)	888.91	GROSS THRUST	23535.90	FUEL FLOW (LB/HR)	6966.34
NET THRUST	11411.54	TSFC	0.6105	NET THRUST/AIRFLOW	12.8376
TOTAL INLET DRAG	12124.35	TOTAL BRAKE SHAFT HP	12.47	BOATTAIL DRAG	0.0
INSTALLED THRUST	11411.54	INSTALLED TSFC	0.6105	SPILLAGE + LIP DRAG	0.0

```
&D
INST=2,ALTP=15000,MACH=.6
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.68793D-01
SUM OF (ERRORS**2)= 0.13867D-01
SUM OF (ERRORS**2)= 0.78908D-03
SUM OF (ERRORS**2)= 0.43931D-04
SUM OF (ERRORS**2)= 0.23920D-05
SUM OF (ERRORS**2)= 0.14105D-06
SUM OF (ERRORS**2)= 0.14901D-02
SUM OF (ERRORS**2)= 0.21834D-03
SUM OF (ERRORS**2)= 0.12523D-04
SUM OF (ERRORS**2)= 0.25491D-05
SUM OF (ERRORS**2)= 0.50099D-06
M9SUB      0
SUM OF (ERRORS**2)= 0.14501D-02
SUM OF (ERRORS**2)= 0.20608D-03
SUM OF (ERRORS**2)= 0.41135D-05
SUM OF (ERRORS**2)= 0.29634D-06
```

INLET MAP M9SUB   NOZZLE MAP   DEL A/B MAP   CFG MAP

DATE RUN 21 NOV 79

ALTITUDE	MACH NUMBER
15000.0 FT	0.60

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1192.90 LBS/FT**2	1521.55 LBS/FT**2	465.20 DEG R	498.69 DEG R	300.61 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
37.00 FT**2	2.10	40.44 FT**2	19.26 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	7780.562
WFT (LBM/HR)	5724.551
SFC (LBM/HR/LBF)	0.736
W2 COR (LBM/SEC)	1009.099
W2 ABS (LBM/SEC)	745.088
RF	0.999
CFG (PRI)	0.975
CGF (SEC)	0.975

INLET MASS FLOW RATIOS

AOSPL/AC	0.345
AOI/AC	0.655
AOBLD/AC	0.0
AO/AC	0.655
AOBYP/AC	0.0
AOE/AC	0.655

INLET DRAG

AC (FT**2)	37.000
CD SPL (TAB 3)	0.000
CD SPL (TAB 3A)	0.0
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.000
DRAG INL TOT (LBF)	0.001
CD INL REF	0.0
DRAG INL REF (LBF)	0.0
CD INL PS	0.000
DRAG INL PS (LBF)	0.001

AFTBODY DRAG

A10/A9	0.0
A10 (FT**2)	40.436
A9 (FT**2)	0.0
P9S/PAMB	0.0
CD A/B	0.0
DRAG A/B (LBF)	0.0
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.0
DRAG A/B TOT (LBF)	0.0
CD A/B REF	0.0
DRAG A/B REF (LBF)	0.0
CD A/B PS	0.0
DRAG A/B PS (LBF)	0.0

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	7780.55
WFT (LBM/HR)	5724.551
SFC (LBM/HR/LBF)	0.73
FN COR (LBF)	13802.801
WFT COR (LBM/HR)	10723.42
SFC COR (LBM/HR/LBF)	0.77

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	85.
FIREWALL (LBM) =	130.
COWL (LBM) =	618.
TOTAL (LBM) =	834.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	273.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	0.
T/O DOORS (LBM) =	0.
TOTAL (LBM) =	273.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	5466.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	5466.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	135.8
FORM (LBF) =	11.6
TOTAL (LBF) =	147.3

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.74509D+03	0.82972D+01	0.46522D+03	0.0	0.12498D+04	0.60000D+00	0.0	0.0
2	0.74484D+03	0.10573D+02	0.49877D+03	0.0	0.10156D+04	0.0	0.0	0.32835D-03
3	0.74484D+03	0.13222D+02	0.53996D+03	0.0	0.84467D+03	0.0	0.0	0.0
4	0.87524D+02	0.12958D+02	0.53996D+03	0.0	0.10128D+03	0.0	0.0	0.96714D-05
5	0.65732D+03	0.12958D+02	0.53996D+03	0.0	0.76062D+03	0.0	0.0	0.0
6	0.83147D+02	0.19305D+03	0.12199D+04	0.0	0.97070D+01	0.0	0.0	0.0
7	0.43762D+01	0.15879D+03	0.11541D+04	0.0	0.0	0.0	0.0	0.0
8	0.84737D+02	0.16956D+03	0.24039D+04	0.19125D-01	0.15811D+02	0.0	0.0	0.44951D-05
9	0.88019D+02	0.44749D+02	0.17849D+04	0.18398D-01	0.53623D+02	0.0	0.0	-0.20132D-06
10	0.89113D+02	0.19439D+02	0.14779D+04	0.18168D-01	0.11372D+03	0.0	0.0	0.0
11	0.65725D+03	0.12699D+02	0.53996D+03	0.0	0.77615D+03	0.80288D+00	0.82972D+01	0.20969D-03
12	0.89113D+02	0.19439D+02	0.14779D+04	0.18168D-01	0.11372D+03	0.10000D+01	0.10429D+02	0.70226D-06
13	0.89113D+02	0.19439D+02	0.14779D+04	0.18168D-01	0.11372D+03	0.11559D+01	0.82972D+01	0.0
14	0.65725D+03	0.12699D+02	0.53996D+03	0.0	0.77607D+03	0.78280D+00	0.82972D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.14692D+05	0.63441D+03	0.37585D+03	0.10721D+01	0.12757D+01	0.60000D+00	0.99891D+00	0.96163D+00	0.15000D+05
2	COMPRESR	-0.10407D+05	0.55494D+04	0.0	0.23103D+01	0.17083D+02	0.94318D+00	0.10466D+04	0.79787D+00	0.12506D+01
3	SPLITTER	0.75101D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.20620D+05	0.70662D+04	0.0	0.13219D+01	0.39554D+02	0.91553D+00	0.11076D+03	0.89714D+00	0.14898D+02
5	DUCT B	0.75434D-01	0.50000D-01	0.30000D+00	0.20131D-01	0.58081D+02	0.57246D+04	0.30907D+00	0.99000D+00	0.24600D+04
6	TURBINE	0.20620D+05	0.70662D+04	0.10000D+01	0.35055D+01	0.67327D+00	0.48751D+04	0.80078D+00	0.89924D+00	0.37892D+01
7	TURBINE	0.10411D+05	0.55494D+04	0.10000D+01	0.25352D+01	0.58279D+00	0.51331D+04	0.84282D+00	0.89985D+00	0.23020D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	-0.56367D-01	0.70662D+04	0.70662D+04	0.70662D+04	0.0	0.0	0.0	-0.27337D-05	0.0
12	SHAFT	0.39558D+01	0.55494D+04	0.55494D+04	0.55494D+04	0.0	0.0	0.0	0.38004D-03	0.0
13	NOZZLE	0.53208D+04	0.19211D+04	0.23428D+01	0.34919D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18640D+01	0.23428D+01
14	NOZZLE	0.17152D+05	0.83961D+03	0.15305D+01	0.23942D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18936D+01	0.15305D+01

MACH= 0.6000   ALTITUDE= 15000.   RECOVERY= 0.9989   3 ITERATIONS   4 PASSES

AIRFLOW (LB/SEC)	745.09	GROSS THRUST	22472.35	FUEL FLOW (LB/HR)	5724.55
NET THRUST	7780.56	TSFC	0.7358	NET THRUST/AIRFLOW	10.4425
TOTAL INLET DRAG	14691.79	TOTAL BRAKE SHAFT HP	3.90	BOATTAIL DRAG	0.0
INSTALLED THRUST	7780.56	INSTALLED TSFC	0.7358	SPILLAGE + LIP DRAG	0.0

LIMITER 19 VIOLATED *** VARIABLE VALUE IS 0.23103D+01 MAXIMUM ALLOWABLE VALUE IS 0.21000D+01

```
&D
ALTP=36000,MACH=.85,SPEC(4,5)=2460
&END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.35009D+00
SUM OF (ERRORS**2)= 0.23761D+00
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.14485D+00
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.73985D-01
SUM OF (ERRORS**2)= 0.26350D-01
SUM OF (ERRORS**2)= 0.27380D-02
SUM OF (ERRORS**2)= 0.69325D-03
SUM OF (ERRORS**2)= 0.25427D-03
SUM OF (ERRORS**2)= 0.11250D-03
SUM OF (ERRORS**2)= 0.58075D-04
SUM OF (ERRORS**2)= 0.31795D-04
SUM OF (ERRORS**2)= 0.18185D-04
SUM OF (ERRORS**2)= 0.10516D-04
SUM OF (ERRORS**2)= 0.61572D-05
SUM OF (ERRORS**2)= 0.36069D-05
SUM OF (ERRORS**2)= 0.21221D-05
SUM OF (ERRORS**2)= 0.12471D-05
SUM OF (ERRORS**2)= 0.73432D-06
SUM OF (ERRORS**2)= 0.91345D-03
SUM OF (ERRORS**2)= 0.50646D-03
SUM OF (ERRORS**2)= 0.31415D-03
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.90428D-07
M9SUB     0
SUM OF (ERRORS**2)= 0.83828D-03
SUM OF (ERRORS**2)= 0.35487D-06
```

INLET MAP M9SUB	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN 21 NOV 79

ALTITUDE	MACH NUMBER
36000.0 FT	0.85

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
473.29 LBS/FT**2	759.08 LBS/FT**2	390.31 DEG R	446.71 DEG R	239.37 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
37.00 FT**2	2.10	40.44 FT**2	19.26 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	4313.395
WFT (LBM/HR)	3481.240
SFC (LBM/HR/LBF)	0.807
W2 COR (LBM/SEC)	1080.494
W2 ABS (LBM/SEC)	419.349
RF	0.999
CFG (PRI)	0.975
CGF (SEC)	0.975

INLET MASS FLOW RATIOS

AOSPL/AC	0.398
AOI/AC	0.602
AOBLD/AC	0.0
AO/AC	0.602
AOBYP/AC	0.0
AOE/AC	0.603

INLET DRAG

AC (FT**2)	37.000
CD SPL (TAB 3)	0.007
CD SPL (TAB 3A)	0.0
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.007
DRAG INL TOT (LBF)	58.334
CD INL REF	0.0
DRAG INL REF (LBF)	0.0
CD INL PS	0.007
DRAG INL PS (LBF)	58.334

AFTBODY DRAG

A10/A9	0.0
A10 (FT**2)	40.436
A9 (FT**2)	0.0
PSS/PAMB	0.0
CD A/B	0.0
DRAG A/B (LBF)	0.0
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.0
DRAG A/B TOT (LBF)	0.0
CD A/B REF	0.0
DRAG A/B REF (LBF)	0.0
CD A/B PS	0.0
DRAG A/B PS (LBF)	0.0

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	4255.059
WFT (LBM/HR)	3481.240
SFC (LBM/HR/LBF)	0.818
FN COR (LBF)	19025.465
WFT COR (LBM/HR)	17943.793
SFC COR (LBM/HR/LBF)	0.943

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	85.
FIREWALL (LBM)	=	130.
COWL (LBM)	=	618.
TOTAL (LBM)	=	834.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	273.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	273.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	5466.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	5466.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	110.7
FORM (LBF)	=	9.4
TOTAL (LBF)	=	120.1

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.41935D+03	0.33065D+01	0.39051D+03	0.0	0.16172D+04	0.85000D+00	0.0	0.0
2	0.41929D+03	0.52967D+01	0.44707D+03	0.0	0.10802D+04	0.0	0.0	0.13464D-03
3	0.41929D+03	0.67980D+01	0.49016D+03	0.0	0.88115D+03	0.0	0.0	0.0
4	0.51383D+02	0.66620D+01	0.49016D+03	0.0	0.11017D+03	0.0	0.0	-0.10246D-03
5	0.36792D+03	0.66620D+01	0.49016D+03	0.0	0.78896D+03	0.0	0.0	0.0
6	0.48813D+02	0.11376D+03	0.11723D+04	0.0	0.94799D+01	0.0	0.0	0.0
7	0.25691D+01	0.92989D+02	0.11062D+04	0.0	0.0	0.0	0.0	0.0
8	0.49779D+02	0.99676D+02	0.24020D+04	0.19810D-01	0.15794D+02	0.0	0.0	0.19661D-04
9	0.51706D+02	0.26344D+02	0.17831D+04	0.19058D-01	0.53480D+02	0.0	0.0	-0.10661D-05
10	0.52349D+02	0.11410D+02	0.14754D+04	0.18820D-01	0.11371D+03	0.0	0.0	0.0
11	0.36795D+03	0.65288D+01	0.49016D+03	0.0	0.80506D+03	0.10000D+01	0.34475D+01	-0.19943D-03
12	0.52349D+02	0.11410D+02	0.14754D+04	0.18820D-01	0.11371D+03	0.10000D+01	0.61219D+01	0.36003D-05
13	0.52349D+02	0.11410D+02	0.14754D+04	0.18820D-01	0.11371D+03	0.14283D+01	0.33065D+01	0.0
14	0.36795D+03	0.65288D+01	0.49016D+03	0.0	0.80514D+03	0.10095D+01	0.33065D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.10732D+05	0.82343D+03	0.48783D+03	0.11448D+01	0.16039D+01	0.85000D+00	0.99879D+00	0.86196D+00	0.36000D+05
2	COMPRESR	-0.61215D+04	0.57625D+04	0.0	0.24928D+01	0.17794D+02	0.10345D+01	0.10466D+04	0.76805D+00	0.12834D+01
3	SPLITTER	0.71610D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.12092D+05	0.71475D+04	0.0	0.13098D+01	0.35560D+02	0.97197D+00	0.11076D+03	0.87653D+00	0.17076D+02
5	DUCT B	0.77701D-01	0.50000D-01	0.30000D+00	0.20853D-01	0.58081D+02	0.34812D+04	0.30094D+00	0.99000D+00	0.24600D+04
6	TURBINE	0.12092D+05	0.71475D+04	0.10000D+01	0.35005D+01	0.67327D+00	0.49332D+04	0.80078D+00	0.89959D+00	0.37835D+01
7	TURBINE	0.61248D+04	0.57625D+04	0.10000D+01	0.25433D+01	0.58279D+00	0.53328D+04	0.84282D+00	0.89940D+00	0.23089D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	-0.68604D-01	0.71475D+04	0.71475D+04	0.71475D+04	0.0	0.0	0.0	-0.56736D-05	0.0
12	SHAFT	0.32748D+01	0.57625D+04	0.57625D+04	0.57625D+04	0.0	0.0	0.0	0.53482D-03	0.0
13	NOZZLE	0.36763D+04	0.22595D+04	0.34508D+01	0.38892D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18638D+01	0.34508D+01
14	NOZZLE	0.11370D+05	0.99417D+03	0.19746D+01	0.23944D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18938D+01	0.19746D+01

MACH= 0.8500   ALTITUDE= 36000.   RECOVERY= 0.9988   1 ITERATIONS   2 PASSES

AIRFLOW (LB/SEC)	419.35	GROSS THRUST	15045.84	FUEL FLOW (LB/HR)	3481.24
NET THRUST	4313.40	TSFC	0.8071	NET THRUST/AIRFLOW	10.2859
TOTAL INLET DRAG	10732.44	TOTAL BRAKE SHAFT HP	3.21	BOATTAIL DRAG	0.0
INSTALLED THRUST	4313.40	INSTALLED TSFC	0.8071	SPILLAGE + LIP DRAG	0.0

LIMITER 19 VIOLATED *** VARIABLE VALUE IS 0.24928D+01 MAXIMUM ALLOWABLE VALUE IS 0.21000D+01

```
&D
ENDIT=1
&END
NEP - INPUT
```

8.1.2 ANALYTICAL INLET

```
&D
IWT=0,ALTP=5000,MACH=.4,INST=1,IFLGRF=0,LABEL=F,
&END
NEP - INPUT
```



```
&I
INMAP=0,NOZMAP=0,CFGMAP=0,DCDMAP=0,
DERP=0,ACI=37.,NWC=1,INLTWT=1,NWD=1,INOZ(1)=0,0,13,14,KVALUE=.00025,
ENGND=1,ICFCN=2,
REFMFR=0.,A10A9R=2.1,SCALE=1.,
FRINT=1.,UNITI=1.,UNITO=1.,INLTYP=1,MODE=0,STOP=0.,
&END
INSTAL - INSTLL
 1
SUM OF (ERRORS**2)= 0.80212D-06
```

OLD INSTALLATION MAPS

```
SUM OF (ERRORS**2)= 0.80212D-06
       )
&PITOT
XMTEFM=.75,ATO=10.,RBYD=.02,DESMN=.85,
NTYPE=-1,INTYPE=0,WIDTH=10.,HEIGHT=5.,XNDOOR=10.,
RHITH=1.25,HT=.4,RMMIT=2.5,
&END
ITOTD
```

```
&WET
ITERFP(1)=1,2,3,8,14,0,
ISECFP(1)=1,2,3,4,5,6,7,9,13,0,
RLFDC=.54,ICCOMP=7,IFCOMP=14,CLMIN=4.,
&END
ETTED AREA - NACWET
&INLWT
SLST=28500.,INLET=4,QMAX=300.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
NLET WEIGHT - INLWT
```

```
*****************************************************
*                                                   *
*              PITOT INLET COORDINATES              *
*                                                   *
*      X   DISTANCE FROM HILITE (INCHES)            *
* R - DITSANCE FROM THE ENGINE CENTERLINE (INCHES)  *
*                                                   *
*****************************************************
```

```
******************************
* INTERNAL INLET COORDINATES *
******************************
```

HILITE TO THROAT

	HILITE							THROAT
X :	0.0	0.412	1.030	2.059	4.118	8.236	14.414	20.591
R :	41.182	39.543	38.610	37.592	36.240	34.593	33.325	32.946

THROAT TO ENGINE FACE

	THROAT										ENGINE FACE
X :	20.591	22.905	25.213	28.656	32.062	35.417	38.711	40.867	42.991	44.930	46.496
R :	32.946	33.055	33.337	34.223	35.455	36.872	38.160	38.828	39.272	39.450	39.052

```
******************************
* EXTERNAL INLET COORDINATES *
******************************
```

HILITE TO MAX NACELLE DIAMETER

	HILITE							
X :	0.0	0.349	1.116	2.325	4.022	6.254	9.067	12.647
R :	41.182	41.369	41.556	41.743	41.930	42.117	42.304	42.491

								MAX NACELLE DIAMETER
X :	13.949	18.598	23.248	27.898	32.547	37.197	41.846	46.496
R :	42.549	42.719	42.842	42.934	42.996	43.028	43.044	43.052

```
***************************
* INLET DIMENSION SUMMERY *
***************************
```

HILITE AREA THROAT AREA HUB/TIP RATIO ENGINE FACE AREA

5327.977 IN**2	3409.904 IN**2	0.400	4024.512 IN**2

OVERALL LENGTH (HILITE TO MAX NACELLE DIAMETER)	SUBSONIC DIFFUSER LENGTH
46.496 IN	25.905 IN

LIP CONTRACTION RATIO (HILITE TO THROAT)	AREA RATIO (ENGINE TO THROAT)
1.563	1.180

WETTED AREA

12496.109 IN**2

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN 21 NOV 79

ALTITUDE	MACH NUMBER
5000.0 FT	0.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1760.15 LBS/FT**2	1965.29 LBS/FT**2	500.86 DEG R	516.89 DEG R	197.14 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
37.00 FT**2	2.10	40.44 FT**2	19.26 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	10952.867
WFT (LBM/HR)	6895.574
SFC (LBM/HR/LBF)	0.630
W2 COR (LBM/SEC)	943.945
W2 ABS (LBM/SEC)	874.314
RF	0.987
CFG (PRI)	0.975
CGF (SEC)	0.975

INLET MASS FLOW RATIOS

AOSPL/AC	0.191
AOI/AC	0.809
AOBLD/AC	0.0
AO/AC	0.809
AOBYP/AC	0.0
AOE/AC	0.809

INLET DRAG

AC (FT**2)	37.000
CD SPL (TAB 3)	0.007
CD SPL (TAB 3A)	0.001
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.008
DRAG INL TOT (LBF)	56.492
CD INL REF	0.001
DRAG INL REF (LBF)	6.826
CD INL PS	0.007
DRAG INL PS (LBF)	0.0

AFTBODY DRAG

A10/A9	0.0
A10 (FT**2)	40.436
A9 (FT**2)	0.0
P9S/PAMB	0.0
CD A/B	0.0
DRAG A/B (LBF)	0.0
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.0
DRAG A/B TOT (LBF)	0.0
CD A/B REF	0.0
DRAG A/B REF (LBF)	0.0
CD A/B PS	0.0
DRAG A/B PS (LBF)	0.0

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	10952.86
WFT (LBM/HR)	6895.57
SFC (LBM/HR/LBF)	0.63
FN COR (LBF)	13168.61
WFT COR (LBM/HR)	8436.82
SFC COR (LBM/HR/LBF)	0.64

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
0.
OPTIMUM COMBINATION OF
BYPASSED AND SPILLED AIR
FOR MINIMUM SPECIFIC FUEL
CONSUMPTION

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	85.
FIREWALL (LBM)	=	130.
COWL (LBM)	=	618.
TOTAL (LBM)	=	834.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	273.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	273.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	5466.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	5466.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	91.4
FORM (LBF)	=	7.8
TOTAL (LBF)	=	99.2

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.87431D+03	0.12228D+02	0.50084D+03	0.0	0.10325D+04	0.40000D+00	0.0	0.0
2	0.87423D+03	0.13478D+02	0.51689D+03	0.0	0.95170D+03	0.0	0.0	0.94816D-04
3	0.87423D+03	0.17068D+02	0.55969D+03	0.0	0.78191D+03	0.0	0.0	0.0
4	0.10700D+03	0.16727D+02	0.55969D+03	0.0	0.97642D+02	0.0	0.0	-0.12893D-03
5	0.76724D+03	0.16727D+02	0.55969D+03	0.0	0.70022D+03	0.0	0.0	0.0
6	0.10165D+03	0.23573D+03	0.12393D+04	0.0	0.97955D+01	0.0	0.0	0.0
7	0.53501D+01	0.19443D+03	0.11736D+04	0.0	0.0	0.0	0.0	0.0
8	0.10356D+03	0.20728D+03	0.24047D+04	0.18843D-01	0.15810D+02	0.0	0.0	0.18325D-04
9	0.10758D+03	0.54602D+02	0.17851D+04	0.18128D-01	0.53714D+02	0.0	0.0	0.38496D-05
10	0.10891D+03	0.23763D+02	0.14787D+04	0.17901D-01	0.11373D+03	0.0	0.0	0.0
11	0.76702D+03	0.16392D+02	0.55969D+03	0.0	0.71451D+03	0.65975D+00	0.12228D+02	0.55157D-03
12	0.10891D+03	0.23763D+02	0.14787D+04	0.17901D-01	0.11373D+03	0.10000D+01	0.12748D+02	0.24035D-04
13	0.10891D+03	0.23763D+02	0.14787D+04	0.17901D-01	0.11373D+03	0.10096D+01	0.12228D+02	0.0
14	0.76702D+03	0.16392D+02	0.55969D+03	0.0	0.71430D+03	0.64326D+00	0.12228D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11925D+05	0.43884D+03	0.25999D+03	0.10320D+01	0.11168D+01	0.40000D+00	0.98691D+00	0.99657D+00	0.50000D+04
2	COMPRESR	-0.12698D+05	0.54069D+04	0.0	0.19464D+01	0.11742D+02	0.90271D+00	0.10466D+04	0.84151D+00	0.12664D+01
3	SPLITTER	0.71713D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25244D+05	0.70746D+04	0.0	0.13257D+01	0.39946D+02	0.90032D+00	0.11076D+03	0.90107D+00	0.14093D+02
5	DUCT B	0.74417D-01	0.50000D-01	0.30000D+00	0.19835D-01	0.58081D+02	0.68956D+04	0.31225D+00	0.99000D+00	0.24600D+04
6	TURBINE	0.25244D+05	0.70746D+04	0.10000D+01	0.35119D+01	0.67327D+00	0.48802D+04	0.80078D+00	0.89928D+00	0.37963D+01
7	TURBINE	0.12704D+05	0.54069D+04	0.10000D+01	0.25302D+01	0.58279D+00	0.50010D+04	0.84282D+00	0.90007D+00	0.22977D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	-0.32666D+00	0.70746D+04	0.70746D+04	0.70746D+04	0.0	0.0	0.0	-0.12940D-04	0.0
12	SHAFT	0.60972D+01	0.54069D+04	0.54069D+04	0.54069D+04	0.0	0.0	0.0	0.48006D-03	0.0
13	NOZZLE	0.58141D+04	0.17176D+04	0.19433D+01	0.34262D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18641D+01	0.19433D+01
14	NOZZLE	0.17064D+05	0.71578D+03	0.13405D+01	0.23942D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18936D+01	0.13405D+01

MACH= 0.4000   ALTITUDE= 5000.   RECOVERY= 0.9869   4 ITERATIONS   5 PASSES

AIRFLOW (LB/SEC)	874.31	GROSS THRUST	22878.11	FUEL FLOW (LB/HR)	6895.58
NET THRUST	10952.87	TSFC	0.6296	NET THRUST/AIRFLOW	12.5274
TOTAL INLET DRAG	11925.24	TOTAL BRAKE SHAFT HP	5.77	BOATTAIL DRAG	0.0
INSTALLED THRUST	10952.87	INSTALLED TSFC	0.6296	SPILLAGE + LIP DRAG	0.0

```
&D
INST=2,ALTP=15000,MACH=.6
&END
NEP - INPUT
```

INLET MAP   NOZZLE MAP   DEL A/B MAP   CFG MAP   DATE RUN 21 NOV 79

ALTITUDE	MACH NUMBER
15000.0 FT	0.60

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1192.90 LBS/FT**2	1521.55 LBS/FT**2	465.20 DEG R	498.69 DEG R	300.61 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
37.00 FT**2	2.10	40.44 FT**2	19.26 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	7074.406
WFT (LBM/HR)	5585.812
SFC (LBM/HR/LBF)	0.790
W2 COR (LBM/SEC)	1008.610
W2 ABS (LBM/SEC)	720.574
RF	0.972
CFG (PRI)	0.975
CGF (SEC)	0.975

INLET MASS FLOW RATIOS

AOSPL/AC	0.363
AOI/AC	0.637
AOBLD/AC	0.0
AO/AC	0.637
AOBYP/AC	0.0
AOE/AC	0.637

INLET DRAG

AC (FT**2)	37.000
CD SPL (TAB 3)	0.027
CD SPL (TAB 3A)	0.020
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.047
DRAG INL TOT (LBF)	522.777
CD INL REF	0.020
DRAG INL REF (LBF)	224.972
CD INL PS	0.027
DRAG INL PS (LBF)	0.0

AFTBODY DRAG

A10/A9	0.0
A10 (FT**2)	40.436
A9 (FT**2)	0.0
P9S/PAMB	0.0
C A/B	0.0
DRAG A/B (LBF)	0.0
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.0
DRAG A/B TOT (LBF)	0.0
CD A/B REF	0.0
DRAG A/B REF (LBF)	0.0
CD A/B PS	0.0
DRAG A/B PS (LBF)	0.0

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	7074.40
WFT (LBM/HR)	5585.81
SFC (LBM/HR/LBF)	0.79
FN COR (LBF)	12550.07
WFT COR (LBM/HR)	10463.53
SFC COR (LBM/HR/LBF)	0.83

REFERENCE INLET MAS[illegible]LOW RATIO = 0.0

BYPASS VS SPILLAGE OPTION NUMBER
0.

OPTIMUM COMBINATION OF BYPASSED AND SPILLED AIR FOR MINIMUM SPECIFIC FUEL CONSUMPTION

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	85.
FIREWALL (LBM) =	130.
COWL (LBM) =	618.
TOTAL (LBM) =	834.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	273.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	0.
T/O DOORS (LBM) =	0.
TOTAL (LBM) =	273.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	135.8
FORM (LBF) =	11.6
TOTAL (LBF) =	147.3

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	5466.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	5466.

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.72057D+03	0.82972D+01	0.46522D+03	0.0	0.12087D+04	0.60000D+00	0.0	0.0
2	0.72066D+03	0.10289D+02	0.49877D+03	0.0	0.10092D+04	0.0	0.0	-0.11277D-03
3	0.72066D+03	0.12917D+02	0.54034D+03	0.0	0.83682D+03	0.0	0.0	0.0
4	0.85435D+02	0.12659D+02	0.54034D+03	0.0	0.10121D+03	0.0	0.0	-0.22656D-03
5	0.63524D+03	0.12659D+02	0.54034D+03	0.0	0.75269D+03	0.0	0.0	0.0
6	0.81164D+02	0.18844D+03	0.12204D+04	0.0	0.97092D+01	0.0	0.0	0.0
7	0.42718D+01	0.15500D+03	0.11546D+04	0.0	0.0	0.0	0.0	0.0
8	0.82716D+02	0.16552D+03	0.24039D+04	0.19117D-01	0.15810D+02	0.0	0.0	-0.81222D-05
9	0.85920D+02	0.43667D+02	0.17848D+04	0.18391D-01	0.53639D+02	0.0	0.0	-0.17379D-06
10	0.86988D+02	0.18975D+02	0.14779D+04	0.18161D-01	0.11372D+03	0.0	0.0	0.0
11	0.63552D+03	0.12406D+02	0.54034D+03	0.0	0.76805D+03	0.77922D+00	0.82972D+01	-0.89248D-03
12	0.86988D+02	0.18975D+02	0.14779D+04	0.18161D-01	0.11372D+03	0.10000D+01	0.10180D+02	0.11328D-06
13	0.86988D+02	0.18975D+02	0.14779D+04	0.18161D-01	0.11372D+03	0.11377D+01	0.82972D+01	0.0
14	0.63552D+03	0.12406D+02	0.54034D+03	0.0	0.76839D+03	0.75974D+00	0.82972D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.14208D+05	0.63441D+03	0.37585D+03	0.10721D+01	0.12757D+01	0.60000D+00	0.97210D+00	0.96163D+00	0.15000D+05
2	COMPRESR	-0.10164D+05	0.55250D+04	0.0	0.22599D+01	0.16272D+02	0.93903D+00	0.10466D+04	0.80466D+00	0.12554D+01
3	SPLITTER	0.74370D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.20132D+05	0.70670D+04	0.0	0.13220D+01	0.39581D+02	0.91531D+00	0.11076D+03	0.89717D+00	0.14886D+02
5	DUCT B	0.75405D-01	0.50000D-01	0.30000D+00	0.20123D-01	0.58081D+02	0.55858D+04	0.30915D+00	0.99000D+00	0.24600D+04
6	TURBINE	0.20132D+05	0.70670D+04	0.10000D+01	0.35066D+01	0.67327D+00	0.48757D+04	0.80078D+00	0.89925D+00	0.37904D+01
7	TURBINE	0.10159D+05	0.55250D+04	0.10000D+01	0.25344D+01	0.58279D+00	0.51106D+04	0.84282D+00	0.89989D+00	0.23013D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	0.11127D+00	0.70670D+04	0.70670D+04	0.70670D+04	0.0	0.0	0.0	0.55269D-05	0.0
12	SHAFT	-0.45201D+01	0.55250D+04	0.55250D+04	0.55250D+04	0.0	0.0	0.0	-0.44483D-03	0.0
13	NOZZLE	0.51275D+04	0.18965D+04	0.22869D+01	0.34778D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18640D+01	0.22869D+01
14	NOZZLE	0.16155D+05	0.81788D+03	0.14952D+01	0.23942D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18936D+01	0.14952D+01

MACH= 0.6000   ALTITUDE= 15000.   RECOVERY= 0.9721   4 ITERATIONS   5 PASSES

AIRFLOW (LB/SEC)	720.57	GROSS THRUST	21282.82	FUEL FLOW (LB/HR)	5585.82
NET THRUST	7074.41	TSFC	0.7896	NET THRUST/AIRFLOW	9.8177
TOTAL INLET DRAG	14208.41	TOTAL BRAKE SHAFT HP	-4.41	BOATTAIL DRAG	0.0
INSTALLED THRUST	7074.41	INSTALLED TSFC	0.7896	SPILLAGE + LIP DRAG	0.0

LIMITER 19 VIOLATED *** VARIABLE VALUE IS 0.22599D+01 MAXIMUM ALLOWABLE VALUE IS 0.21000D+01

```
&D
ALTP=36000,MACH=.85,SPEC(4,5)=2460
&END
NEP - INPUT
```

INLET MAP   NOZZLE MAP   DEL A/B MAP   CFG MAP

DATE RUN
21 NOV 79

ALTITUDE	MACH NUMBER
36000.0 FT	0.85

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
473.29 LBS/FT**2	759.08 LBS/FT**2	390.31 DEG R	446.71 DEG R	239.37 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
37.00 FT**2	2.10	40.44 FT**2	19.26 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	3616.959
WFT (LBM/HR)	3296.640
SFC (LBM/HR/LBF)	0.911
W2 COR (LBM/SEC)	1081.170
W2 ABS (LBM/SEC)	397.148
RF	0.946
CFG (PRI)	0.975
CGF (SEC)	0.975

INLET MASS FLOW RATIOS

AOSPL/AC	0.419
AOI/AC	0.581
AOBLD/AC	0.0
AO/AC	0.581
AOBYP/AC	0.010
AOE/AC	0.571

INLET DRAG

AC (FT**2)	37.000
CD SPL (TAB 3)	0.057
CD SPL (TAB 3A)	0.053
CD BLD	0.0
CD BYP	0.001
CD INL TOT	0.111
DRAG INL TOT (LBF)	985.953
CD INL REF	0.053
DRAG INL REF (LBF)	470.517
CD INL PS	0.058
DRAG INL PS (LBF)	0.0

AFTBODY DRAG

A10/A9	0.0
A10 (FT**2)	40.436
A9 (FT**2)	0.0
P9S/PAMB	0.0
CD A/B	0.0
DRAG A/B (LBF)	0.0
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.0
DRAG A/B TOT (LBF)	0.0
CD A/B REF	0.0
DRAG A/B REF (LBF)	0.0
CD A/B PS	0.0
DRAG A/B PS (LBF)	0.0

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	3616.959
WFT (LBM/HR)	3296.640
SFC (LBM/HR/LBF)	0.911
FN COR (LBF)	16172.355
WFT COR (LBM/HR)	16992.289
SFC COR (LBM/HR/LBF)	1.051

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
0.
OPTIMUM COMBINATION OF
BYPASSED AND SPILLED AIR
FOR MINIMUM SPECIFIC FUEL
CONSUMPTION

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	85.
FIREWALL (LBM) =	130.
COWL (LBM) =	618.
TOTAL (LBM) =	834.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	273.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	0.
T/O DOORS (LBM) =	0.
TOTAL (LBM) =	273.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	5466.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	5466.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	110.7
FORM (LBF) =	9.4
TOTAL (LBF) =	120.1

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.39715D+03	0.33065D+01	0.39051D+03	0.0	0.15316D+04	0.85000D+00	0.0	0.0
2	0.39709D+03	0.50157D+01	0.44707D+03	0.0	0.10803D+04	0.0	0.0	0.14715D-03
3	0.39709D+03	0.64379D+01	0.49017D+03	0.0	0.88118D+03	0.0	0.0	0.0
4	0.48659D+02	0.63091D+01	0.49017D+03	0.0	0.11018D+03	0.0	0.0	0.84202D-05
5	0.34843D+03	0.63091D+01	0.49017D+03	0.0	0.78898D+03	0.0	0.0	0.0
6	0.46226D+02	0.10773D+03	0.11723D+04	0.0	0.94799D+01	0.0	0.0	0.0
7	0.24329D+01	0.88060D+02	0.11062D+04	0.0	0.0	0.0	0.0	0.0
8	0.47141D+02	0.94393D+02	0.24020D+04	0.19810D-01	0.15794D+02	0.0	0.0	0.50995D-05
9	0.48966D+02	0.24949D+02	0.17831D+04	0.19058D-01	0.53479D+02	0.0	0.0	-0.11315D-07
10	0.49574D+02	0.10805D+02	0.14754D+04	0.18820D-01	0.11371D+03	0.0	0.0	0.0
11	0.34842D+03	0.61830D+01	0.49017D+03	0.0	0.80508D+03	0.98868D+00	0.33065D+01	0.74271D-04
12	0.49574D+02	0.10805D+02	0.14754D+04	0.18820D-01	0.11371D+03	0.10000D+01	0.57974D+01	0.32266D-06
13	0.49574D+02	0.10805D+02	0.14754D+04	0.18820D-01	0.11371D+03	0.13917D+01	0.33065D+01	0.0
14	0.34842D+03	0.61830D+01	0.49017D+03	0.0	0.80505D+03	0.96396D+00	0.33065D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.10164D+05	0.8234[illegible]D+03	0.48783D+03	0.11448D+01	0.16039D+01	0.85000D+00	0.94581D+00	0.86196D+00	0.36000D+05
2	COMPRESR	-0.58009D+04	0.57633D+04	0.0	0.24927D+01	0.17795D+02	0.10346D+01	0.10466D+04	0.76796D+00	0.12835D+01
3	SPLITTER	0.71607D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.11451D+05	0.71474D+04	0.0	0.13098D+01	0.35562D+02	0.97195D+00	0.11076D+03	0.87654D+00	0.17075D+02
5	DUCT B	0.77697D-01	0.50000D-01	0.30000D+00	0.20853D-01	0.58081D+02	0.32966D+04	0.30094D+00	0.99000D+00	0.24600D+04
6	TURBINE	0.11451D+05	0.71474D+04	0.10000D+01	0.35004D+01	0.67327D+00	0.49332D+04	0.80078D+00	0.89959D+00	0.37835D+01
7	TURBINE	0.58003D+04	0.57633D+04	0.10000D+01	0.25433D+01	0.58279D+00	0.53335D+04	0.84282D+00	0.89940D+00	0.23089D+01
8	DUCT B	0.0	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	SHAFT	-0.25456D-01	0.71474D+04	0.71474D+04	0.71474D+04	0.0	0.0	0.0	-0.22231D-05	0.0
12	SHAFT	0.26781D+00	0.57633D+04	0.57633D+04	0.57633D+04	0.0	0.0	0.0	0.46173D-04	0.0
13	NOZZLE	0.34157D+04	0.22168D+04	0.32680D+01	0.38161D+03	0.34259D+03	0.98000D+00	0.97500D+00	0.18638D+01	0.32680D+01
14	NOZZLE	0.10366D+05	0.95719D+03	0.18700D+01	0.23942D+04	0.23942D+04	0.98000D+00	0.97500D+00	0.18938D+01	0.18700D+01

MACH= 0.8500   ALTITUDE= 36000.   RECOVERY= 0.9458   1 ITERATIONS   2 PASSES

AIRFLOW (LB/SEC)	397.15	GROSS THRUST	13781.23	FUEL FLOW (LB/HR)	3296.64
NET THRUST	3616.96	TSFC	0.9114	NET THRUST/AIRFLOW	9.1073
TOTAL INLET DRAG	10164.27	TOTAL BRAKE SHAFT HP	0.24	BOATTAIL DRAG	0.0
INSTALLED THRUST	3616.96	INSTALLED TSFC	0.9114	SPILLAGE + LIP DRAG	0.0

LIMITER 19 VIOLATED *** VARIABLE VALUE IS 0.24927D+01 MAXIMUM ALLOWABLE VALUE IS 0.21000D+01

```
&D
ENDIT=1
&END
NEP - INPUT
```

8.2 SUPERSONIC MIXED FLOW AFTERBURNING TURBOFAN

8.2.1 DATABASE INLET 'ASF', DATABASE NOZZLE 'ADENAB'

```
  INSTAL & WATE-2 : TYPICAL SUPERSCNIC AUGMENTED MIXED FLOW
&D NMODES=1,NCOMP=29,NOSTAT=14,MODESN=1,TABLES=T,ITPRT=0,NCODE=1,IWAY=1,
LABEL=F,PUNT=T,PINPUT=T,DRAW=T,BOAT=F,SPILL=F,INLTDS=F,SPLDES=.02,NVOPT=0,
IWT=1,INST=0,IFLGRF=0,
&END
NEP - INPUT
```

TABLE DATA INPUT SUMMARY 10 TABLES

TABLE NUMBER	REFERENCE NUMBER	ARRAY LOCATION
1	1001	1
2	1002	1075
3	1003	2149
4	1004	3223
5	1005	4459
6	1006	5695
7	1007	6931
8	1008	7384
9	1009	7978
10	1010	8431

DATA STORAGE ALLOCATION 20000
DATA STORAGE NOT USED 10828

```
&D MODE=1,
KONFIG(1,1)='INLT',1,0,2,0,SPEC(1,1)=250,4*0,1,
KONFIG(1,2)='COMP',2,0,3,0,SPEC(1,2)=1.5,0,1,1001,1,1002,1,1003,1,0,0,.85,3,1,
KONFIG(1,3)='SPLT',3,0,4,5,SPEC(1,3)=1.0,.02,.02,
KONFIG(1,4)='COMP',4,0,6,7,SPEC(1,4)=1.3,.05,1,1004,1,1005,1,1006,1,0,.1,.86,
6,1,
KONFIG(1,5)='DUCT',6,0,8,0,SPEC(1,5)=.05,.3,0,3000,.99,18300,0,0,0,.05,
KONFIG(1,6)='TURB',8,7,9,0,SPEC(1,6)=3.5,.75,1,1007,1,1008,.9,1,.8,1,.9,5000,1,
KONFIG(1,7)='TURB',9,7,10,0,SPEC(1,7)=2.5,.25,1,1009,1,1010,.9,1,1,1,.9,5000,1,
KONFIG(1,8)='MIXR',10,5,11,0,SPEC(1,8)=0,0,.4,1,
KONFIG(1,9)='DUCT',11,0,12,0,SPEC(1,9)=.06,.3,0,0,.98,18300,
KONFIG(1,10)='NOZZ',12,0,13,0,SPEC(1,10)=0,.98,0,0,.975,1,0,0,1,
KONFIG(1,11)='SHFT',4,6,0,0,SPEC(1,11)=8000,2*1,0,0,2*1,0,0,
KONFIG(1,12)='SHFT',2,7,0,0,SPEC(1,12)=6000,2*1,0,0,2*1,0,0,
KONFIG(1,15)='CNTL',SPCNTL(1,15)=1,7,'STAP',8,12,0,1,
KONFIG(1,16)='CNTL',SPCNTL(1,16)=1,6,'STAP',8,9,0,1,
KONFIG(1,17)='CNTL',SPCNTL(1,17)=1,4,'STAP',8,8,0,1,1.1,1.75,
KONFIG(1,18)='CNTL',SPCNTL(1,18)=1,3,'DOUT',8,8,0,1,
KONFIG(1,19)='CNTL',SPCNTL(1,19)=1,2,'STAP',8,4,0,1,1.1,2.1,
KONFIG(1,20)='CNTL',SPCNTL(1,20)=1,1,'STAP',8,2,0,1,
KONFIG(1,21)='CNTL',SPCNTL(1,21)=4,5,'DOUT',6,2,1.0,0,0,3000,
KONFIG(1,22)='OPTV',0,0,10,0,SPEC(1,22)=0,0,0,1,0,0,0,0,0,
KONFIG(1,23)='OPTV',0,0,2,0,SPEC(1,23)=0,-5,10,10,0,0,0,0,0,
KONFIG(1,24)='LIMV',SPLIMV(1,24)=0,.6,1.05,'DOUT',6,4,0,0,1,
KONFIG(1,28)='CNTL',SPCNTL(1,28)=1,11,'DOUT',8,11,0,1,
KONFIG(1,29)='CNTL',SPCNTL(1,29)=1,12,'DOUT',8,12,0,1,
&END
NEP - INPUT
```


C-4

```
                                   1
                                <INLT    1>
                                   2
                                <COMP    2>
                                   3
                                <SPLT    3>      <SPLT    3>
                                   4                 5
           <COMP    4>          <COMP    4>      <MIXR    8>
              7                    6
           <TURB    6>          <DUCT    5>
                                   8
           <TURB    7>          <TURB    6>
                                   9
                                <TURB    7>
                                  10
                                <MIXR    8>
                                  11
                                <DUCT    9>
                                  12
                                <NOZZ   10>
                                  13
```

SHAFT (11) IS CONNECTED TO COMP(4) AND TURB(6) AND

SHAFT (12) IS CONNECTED TO COMP(2) AND TURB(7) AND

THE FOLLOWING REPRESENTS THE CONFIGURATION FOR MODE= 1
INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW
CONFIGURATION DATA 13 STATIONS 29 COMPONENTS

COMPONENT NUMBER	NKIND	COMPONENT TYPE	UPSTREAM STATIONS		DOWNSTREAM STATIONS	
1	1	INLET	1	0	2	0
2	4	COMPRESR	2	0	3	0
3	7	SPLITTER	3	0	4	5
4	4	COMPRESR	4	0	6	7
5	2	DUCT E	6	0	8	0
6	5	TURBINE	8	7	9	0
7	5	TURBINE	9	7	10	0
8	8	MIXER	10	5	11	0
9	2	DUCT B	11	0	12	0
10	9	NOZZLE	12	0	13	0
11	11	SHAFT	4	6	0	0
12	11	SHAFT	2	7	0	0
15	12	CONTROL	12	0	7	0
16	12	CONTROL	9	0	6	0
17	12	CONTROL	8	0	4	0
18	12	CONTROL	8	0	3	0
19	12	CONTROL	4	0	2	0
20	12	CONTROL	2	0	1	0
21	12	CONTROL	2	0	5	0
22	13	OPTVAR	0	0	10	0
23	13	OPTVAR	0	0	2	0
24	14	LIMITER	0	0	4	0
28	12	CONTROL	11	0	11	0
29	12	CONTROL	12	0	12	0

CONTROL INFORMATION

```
15        VARY DATINP  1 OF COMPONENT  7 SO THAT STATP  8 OF FLOW STATION 12 EQUALS  0.0
16        VARY DATINP  1 OF COMPONENT  6 SO THAT STATP  8 OF FLOW STATION  9 EQUALS  0.0
17        VARY DATINP  1 OF COMPONENT  4 SO THAT STATP  8 OF FLOW STATION  8 EQUALS  0.0
18        VARY DATINP  1 OF COMPONENT  3 SO THAT DATOUT 8 OF COMPONENT  8 EQUALS  0.0
19        VARY DATINP  1 OF COMPONENT  2 SO THAT STATP  8 OF FLOW STATION  4 EQUALS  0.0
20        VARY DATINP  1 OF COMPONENT  1 SO THAT STATP  8 OF FLOW STATION  2 EQUALS  0.0
21        VARY DATINP  4 OF COMPONENT  5 SO THAT DATOUT 6 OF COMPONENT  2 EQUALS  0.10000D+01
28        VARY DATINP  1 OF COMPONENT 11 SO THAT DATOUT 8 OF COMPONENT 11 EQUALS  0.0
29        VARY DATINP  1 OF COMPONENT 12 SO THAT DATOUT 8 OF COMPONENT 12 EQUALS  0.0
```

CASE IDENTIFICATION   INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW

INPUT DATA

COMPONENT NO.	TYPE	DATINP1	DATINP2	DATINP3	DATINP4	DATINP5	DATINP6	DATINP7	DATINP8	DATINP9
1	INLET	0.25000D+03	0.0	0.0	0.0	0.0	0.10000D+01	0.0	0.0	0.0
2	COMPRESR	0.15000D+01	0.0	0.10000D+01	0.10010D+04	0.10000D+01	0.10020D+04	0.10000D+01	0.10030D+04	0.10000D+01
3	SPLITTER	0.10000D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	0.13000D+01	0.50000D-01	0.10000D+01	0.10040D+04	0.10000D+01	0.10050D+04	0.10000D+01	0.10060D+04	0.10000D+01
5	DUCT B	0.50000D-01	0.30000D+00	0.0	0.30000D+04	0.99000D+00	0.18300D+05	0.0	0.0	0.0
6	TURBINE	0.35000D+01	0.75000D+00	0.10000D+01	0.10070D+04	0.10000D+01	0.10080D+04	0.90000D+00	0.10000D+01	0.80000D+00
7	TURBINE	0.25000D+01	0.25000D+00	0.10000D+01	0.10090D+04	0.10000D+01	0.10100D+04	0.90000D+00	0.10000D+01	0.10000D+01
8	MIXER	0.0	0.0	0.40000D+00	0.10000D+01	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.60000D-01	0.30000D+00	0.0	0.0	0.98000D+00	0.18300D+05	0.0	0.0	0.0
10	NOZZLE	0.0	0.98000D+00	0.0	0.0	0.97500D+00	0.10000D+01	0.0	0.0	0.10000D+01
11	SHAFT	0.80000D+04	0.10000D+01	0.10000D+01	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.0
12	SHAFT	0.60000D+04	0.10000D+01	0.10000D+01	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.0
15	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
16	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
17	CONTROL	0.0	0.11000D+01	0.17500D+01	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
18	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.0	0.80000D+01	0.0	0.10000D+01
19	CONTROL	0.0	0.11000D+01	0.21000D+01	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
20	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.80000D+01	0.0	0.0	0.10000D+01
21	CONTROL	0.0	0.0	0.30000D+04	0.40000D+01	0.10000D+01	0.0	0.60000D+01	0.0	0.0
22	OPTVAR	0.0	0.0	0.0	0.10000D+01	0.0	0.0	0.0	0.0	0.0
23	OPTVAR	0.0	-0.50000D+01	0.10000D+02	0.10000D+02	0.0	0.0	0.0	0.0	0.0
24	LIMITER	0.0	0.60000D+00	0.10500D+01	0.0	0.0	0.0	0.60000D+01	0.0	0.10000D+01
28	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.0	0.80000D+01	0.0	0.10000D+01
29	CONTROL	0.0	0.0	0.0	0.10000D+01	0.0	0.0	0.80000D+01	0.0	0.10000D+01

THE MAXIMUM COMPONENT NUMBER USED 29 DOES NOT EQUAL 24 THE NUMBER OF COMPONENTS CONFIGURED IN ANY ONE MODE - WARNING ONLY

MODE 1 NOW BEING USED
SUM OF (ERRORS**2)= 0.78997D-32

UPDATED INPUT DATA TO REFLECT CALCULATED INPUT

COMPONENT NO.	TYPE	DATINP1	DATINP2	DATINP3	DATINP4	DATINP5	DATINP6	DATINP7	DATINP8	DATINP9
1	INLET	0.25000D+03	0.0	0.14696D+02	0.0	0.0	0.10000D+01	0.0	0.0	0.0
2	COMPRESR	0.15000D+01	0.0	0.60000D+04	0.10010D+04	0.25381D+03	0.10020D+04	0.98277D+00	0.10030D+04	0.10060D+01
3	SPLITTER	0.10000D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	0.13000D+01	0.50000D-01	0.66842D+04	0.10040D+04	0.49649D+02	0.10050D+04	0.91142D+00	0.10060D+04	0.76966D+00
5	DUCT B	0.50000D-01	0.30000D+00	0.0	0.30000D+04	0.99000D+00	0.18300D+05	0.66156D+02	0.0	0.0
6	TURBINE	0.35000D+01	0.75000D+00	0.67376D+00	0.10070D+04	0.96971D+00	0.10080D+04	0.10204D+01	0.52764D+00	0.80000D+00
7	TURBINE	0.25000D+01	0.25000D+00	0.55526D+00	0.10090D+04	0.65713D+00	0.1010UD+04	0.98318D+00	0.77880D+00	0.10000D+01
8	MIXER	0.40389D+03	0.27387D+03	0.40000D+00	0.10000D+01	0.0	0.0	0.0	0.0	0.0
9	DUCT B	0.60000D-01	0.30000D+00	0.0	0.0	0.98000D+00	0.18300D+05	0.0	0.0	0.0
10	NOZZLE	0.45627D+03	0.98000D+00	0.0	0.0	0.97500D+00	0.10000D+01	0.0	0.0	0.10000D+01
11	SHAFT	0.80000D+04	0.10000D+01	0.10000D+01	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.0
12	SHAFT	0.60000D+04	0.10000D+01	0.10000D+01	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.0

CASE IDENTIFICATION INSTAL & WATE-2 : TYPICAL SUPERSONIC AUGMENTED MIXED FLOW

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.25000D+03	0.14696D+02	0.51867D+03	0.0	0.25000D+03	0.0	0.0	0.0
2	0.25000D+03	0.14696D+02	0.51867D+03	0.0	0.25000D+03	0.0	0.0	0.0
3	0.25000D+03	0.44088D+02	0.74297D+03	0.0	0.99736D+02	0.0	0.0	0.0
4	0.12500D+03	0.43206D+02	0.74297D+03	0.0	0.50886D+02	0.0	0.0	0.0
5	0.12500D+03	0.43206D+02	0.74297D+03	0.0	0.50886D+02	0.33560D+00	0.39972D+02	0.0
6	0.11875D+03	0.25924D+03	0.12947D+04	0.0	0.10636D+02	0.0	0.0	0.0
7	0.62500D+01	0.22439D+03	0.12411D+04	0.0	0.0	0.0	0.0	0.0
8	0.12203D+03	0.22294D+03	0.29249D+04	0.27642D-01	0.19103D+02	0.0	0.0	0.0
9	0.12672D+03	0.96130D+02	0.24225D+04	0.26592D-01	0.41866D+02	0.0	0.0	0.0
10	0.12828D+03	0.44336D+02	0.20524D+04	0.26260D-01	0.84583D+02	0.40000D+00	0.39972D+02	0.0
11	0.25328D+03	0.43551D+02	0.14436D+04	0.13130D-01	0.14258D+03	0.0	0.0	0.0
12	0.25328D+03	0.40938D+02	0.14436D+04	0.13130D-01	0.15168D+03	0.10000D+01	0.21925D+02	0.0
13	0.25328D+03	0.40938D+02	0.14436D+04	0.13130D-01	0.15168D+03	0.12799D+01	0.14696D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.0	0.0	0.0	0.10000D+01	0.10000D+01	0.0	0.10000D+01	0.10000D+01	0.0
2	COMPRESR	-0.19107D+05	0.60000D+04	0.0	0.15000D+01	0.53928D+01	0.10000D+01	0.25381D+03	0.85000D+00	0.30000D+01
3	SPLITTER	0.10000D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.24219D+05	0.80000D+04	0.0	0.13000D+01	0.28130D+02	0.10000D+01	0.49649D+02	0.86000D+00	0.60000D+01
5	DUCT B	0.94773D-01	0.50000D-01	0.30000D+00	0.29097D-01	0.66156D+02	0.11817D+05	0.30000D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.24219D+05	0.80000D+04	0.10000D+01	0.35000D+01	0.67376D+00	0.50000D+04	0.96971D+00	0.90000D+00	0.23191D+01
7	TURBINE	0.19107D+05	0.60000D+04	0.10000D+01	0.25000D+01	0.55526D+00	0.50000D+04	0.65713D+00	0.90000D+00	0.21682D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11092D+01	0.10809D+01	0.84873D+03	0.44271D+03	0.64835D+03	0.88880D-16	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.16206D+05	0.20586D+04	0.27857D+01	0.48341D+03	0.45627D+03	0.98000D+00	0.97500D+00	0.18672D+01	0.27857D+01
11	SHAFT	0.0	0.80000D+04	0.80000D+04	0.80000D+04	0.0	0.0	0.0	0.0	0.0
12	SHAFT	0.0	0.60000D+04	0.60000D+04	0.60000D+04	0.0	0.0	0.0	0.0	0.0

MACH= 0.0 ALTITUDE= 0. RECOVERY= 1.0000 0 ITERATIONS 2 PASSES

AIRFLOW (LB/SEC)	250.00	GROSS THRUST	16205.61	FUEL FLOW (LB/HR)	11816.87
NET THRUST	16205.61	TSFC	0.7292	NET THRUST/AIRFLOW	64.8225
TOTAL INLET DRAG	0.0	TOTAL BRAKE SHAFT HP	0.0	BOATTAIL DRAG	0.0
INSTALLED THRUST	16205.61	INSTALLED TSFC	0.7292	SPILLAGE + LIP DRAG	0.0

```
&D ALTP=10000,MACH=.6,ETAR=0,LABEL=T &END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.16605D-01
SUM OF (ERRORS**2)= 0.52530D-03
SUM OF (ERRORS**2)= 0.87988D-05
SUM OF (ERRORS**2)= 0.18107D-06
```

CASE IDENTIFICATION MIL SPEC INLET

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.22004D+03	0.10108D+02	0.48303D+03	0.0	0.30871D+03	0.60000D+00	0.0	0.0
2	0.21995D+03	0.12897D+02	0.51785D+03	0.0	0.25053D+03	0.0	0.0	0.42553D-03
3	0.21995D+03	0.38782D+02	0.74239D+03	0.0	0.99714D+02	0.0	0.0	0.0
4	0.11003D+03	0.38006D+02	0.74239D+03	0.0	0.50899D+02	0.0	0.0	-0.51060D-08
5	0.10992D+03	0.38006D+02	0.74239D+03	0.0	0.50849D+02	0.33530D+00	0.35167D+02	0.0
6	0.10453D+03	0.22819D+03	0.12941D+04	0.0	0.10633D+02	0.0	0.0	0.0
7	0.55014D+01	0.19751D+03	0.12405D+04	0.0	0.0	0.0	0.0	0.0
8	0.10742D+03	0.19623D+03	0.29249D+04	0.27651D-01	0.19103D+02	0.0	0.0	0.18094D-08
9	0.11154D+03	0.84620D+02	0.24225D+04	0.26601D-01	0.41864D+02	0.0	0.0	0.25130D-10
10	0.11292D+03	0.39010D+02	0.20522D+04	0.26268D-01	0.84614D+02	0.40016D+00	0.35167D+02	0.0
11	0.22284D+03	0.38316D+02	0.14436D+04	0.13140D-01	0.14258D+03	0.0	0.0	0.0
12	0.22284D+03	0.36017D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.10000D+01	0.19289D+02	-0.44117D-08
13	0.22284D+03	0.36017D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.14480D+01	0.10108D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.44211D+04	0.64644D+03	0.38298D+03	0.10721D+01	0.12759D+01	0.60000D+00	0.10000D+01	0.99842D+00	0.10000D+05
2	COMPRESR	-0.16827D+05	0.60050D+04	0.0	0.15047D+01	0.54534D+01	0.10016D+01	0.25381D+03	0.84986D+00	0.30069D+01
3	SPLITTER	0.99902D+00	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.21317D+05	0.79990D+04	0.0	0.12996D+01	0.28061D+02	0.10003D+01	0.49649D+02	0.85982D+00	0.60041D+01
5	DUCT B	0.94802D-01	0.50000D-01	0.30000D+00	0.29106D-01	0.66156D+02	0.10405D+05	0.29991D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.21317D+05	0.79990D+04	0.10000D+01	0.34998D+01	0.67376D+00	0.49994D+04	0.96971D+00	0.90000D+00	0.23190D+01
7	TURBINE	0.16827D+05	0.60050D+04	0.10000D+01	0.25013D+01	0.55526D+00	0.50042D+04	0.65713D+00	0.90000D+00	0.21692D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11093D+01	0.10807D+01	0.84902D+03	0.44216D+03	0.64832D+03	0.30420D-08	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.15633D+05	0.22571D+04	0.35631D+01	0.52331D+03	0.45627D+03	0.98000D+00	0.97500D+00	0.18672D+01	0.35631D+01
11	SHAFT	-0.21652D-03	0.79990D+04	0.79990D+04	0.79990D+04	0.0	0.0	0.0	-0.10157D-07	0.0
12	SHAFT	0.76727D-04	0.60050D+04	0.60050D+04	0.60050D+04	0.0	0.0	0.0	0.45597D-08	0.0

MACH= 0.6000 ALTITUDE= 10000. RECOVERY= 1.0000 3 ITERATIONS 12 PASSES

AIRFLOW (LB/SEC)	220.04	GROSS THRUST	15632.75	FUEL FLOW (LB/HR)	10404.86
NET THRUST	11211.64	TSFC	0.9280	NET THRUST/AIRFLOW	50.9521
TOTAL INLET DRAG	4421.12	TOTAL BRAKE SHAFT HP	-0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	11211.64	INSTALLED TSFC	0.9280	SPILLAGE + LIP DRAG	0.0

```
&D ALTP=15000,MACH=1.0,ETAR=0 &END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.19012D-01
SUM OF (ERRORS**2)= 0.44139D-04
SUM OF (ERRORS**2)= 0.12514D-05
```

CASE IDENTIFICATION   TRANSONIC CLIMB - DRY

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.23649D+03	0.82972D+01	0.46522D+03	0.0	0.39669D+03	0.10000D+01	0.0	0.0
2	0.23665D+03	0.15720D+02	0.55835D+03	0.0	0.22938D+03	0.0	0.0	-0.66477D-03
3	0.23665D+03	0.41986D+02	0.77008D+03	0.0	0.10093D+03	0.0	0.0	0.0
4	0.11516D+03	0.41147D+02	0.77008D+03	0.0	0.50137D+02	0.0	0.0	0.39265D-03
5	0.12144D+03	0.41147D+02	0.77008D+03	0.0	0.52850D+02	0.35081D+00	0.37797D+02	0.0
6	0.10940D+03	0.23848D+03	0.13211D+04	0.0	0.10760D+02	0.0	0.0	0.0
7	0.57580D+01	0.20687D+03	0.12676D+04	0.0	0.0	0.0	0.0	0.0
8	0.11236D+03	0.20535D+03	0.29259D+04	0.27244D-01	0.19102D+02	0.0	0.0	0.17632D-03
9	0.11668D+03	0.88408D+02	0.24229D+04	0.26209D-01	0.41921D+02	0.0	0.0	0.97506D-05
10	0.11812D+03	0.41734D+02	0.20627D+04	0.25882D-01	0.82948D+02	0.39064D+00	0.37805D+02	0.0
11	0.23956D+03	0.41186D+02	0.14440D+04	0.12596D-01	0.14262D+03	0.0	0.0	0.0
12	0.23952D+03	0.38715D+02	0.14440D+04	0.12596D-01	0.15173D+03	0.10000D+01	0.20732D+02	0.39209D-03
13	0.23952D+03	0.38715D+02	0.14440D+04	0.12596D-01	0.15170D+03	0.16233D+01	0.82972D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.77719D+04	0.10574D+04	0.62642D+03	0.12002D+01	0.18946D+01	0.10000D+01	0.10000D+01	0.10765D+01	0.15000D+05
2	COMPRESR	-0.17102D+05	0.57958D+04	0.0	0.13835D+01	0.42685D+01	0.93100D+00	0.25381D+03	0.85085D+00	0.26709D+01
3	SPLITTER	0.10541D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.22354D+05	0.80247D+04	0.0	0.13177D+01	0.31432D+02	0.98527D+00	0.49649D+02	0.86746D+00	0.57958D+01
5	DUCT B	0.93584D-01	0.50000D-01	0.30000D+00	0.28678D-01	0.66156D+02	0.10730D+05	0.30393D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.22352D+05	0.80247D+04	0.10000D+01	0.35069D+01	0.67376D+00	0.50146D+04	0.96971D+00	0.90009D+00	0.23228D+01
7	TURBINE	0.17113D+05	0.57958D+04	0.10000D+01	0.24360D+01	0.55526D+00	0.48294D+04	0.65713D+00	0.89994D+00	0.21184D+01
8	MIXER	0.40339D+03	0.27387D+03	0.11039D+01	0.10886D+01	0.83138D+03	0.47053D+03	0.64845D+03	-0.20146D-03	0.10896D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.18194D+05	0.24439D+04	0.46661D+01	0.58343D+03	0.45627D+03	0.98000D+00	0.97500D+00	0.18674D+01	0.46661D+01
11	SHAFT	-0.25089D+01	0.80247D+04	0.80247D+04	0.80247D+04	0.0	0.0	0.0	-0.11224D-03	0.0
12	SHAFT	0.11050D+02	0.57958D+04	0.57958D+04	0.57958D+04	0.0	0.0	0.0	0.64590D-03	0.0

MACH= 1.0000   ALTITUDE= 15000.   RECOVERY= 1.0000   2 ITERATIONS   11 PASSES

AIRFLOW (LB/SEC)	236.49	GROSS THRUST	18193.67	FUEL FLOW (LB/HR)	10730.15
NET THRUST	10421.74	TSFC	1.0296	NET THRUST/AIRFLOW	44.0684
TOTAL INLET DRAG	7771.93	TOTAL BRAKE SHAFT HP	8.54	BOATTAIL DRAG	0.0
INSTALLED THRUST	10421.74	INSTALLED TSFC	1.0296	SPILLAGE + LIP DRAG	0.0

```
&D ALTP=20000,MACH=1.4,ETAR=0 &END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.34607D-01
SUM OF (ERRORS**2)= 0.80380D-03
SUM OF (ERRORS**2)= 0.36452D-05
SUM OF (ERRORS**2)= 0.78561D-07
```

CASE IDENTIFICATION   SET UP FOR AFTERBURNING

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.26544D+03	0.67589D+01	0.44741D+03	0.0	0.53603D+03	0.14000D+01	0.0	0.0
2	0.26551D+03	0.21058D+02	0.62285D+03	0.0	0.20300D+03	0.0	0.0	-0.27275D-03
3	0.26551D+03	0.47672D+02	0.81431D+03	0.0	0.10255D+03	0.0	0.0	0.0
4	0.12302D+03	0.46719D+02	0.81431D+03	0.0	0.48488D+02	0.0	0.0	0.45403D-04
5	0.14249D+03	0.46719D+02	0.81431D+03	0.0	0.56159D+02	0.37720D+00	0.42364D+02	0.0
6	0.11687D+03	0.25415D+03	0.13622D+04	0.0	0.10952D+02	0.0	0.0	0.0
7	0.61509D+01	0.22135D+03	0.13091D+04	0.0	0.0	0.0	0.0	0.0
8	0.11998D+03	0.21929D+03	0.29275D+04	0.26624D-01	0.19102D+02	0.0	0.0	-0.17908D-04
9	0.12459D+03	0.94486D+02	0.24253D+04	0.25613D-01	0.41904D+02	0.0	0.0	-0.12361D-04
10	0.12613D+03	0.46395D+02	0.20819D+04	0.25293D-01	0.80045D+02	0.37439D+00	0.42365D+02	0.0
11	0.26862D+03	0.46194D+02	0.14446D+04	0.11719D-01	0.14261D+03	0.0	0.0	0.0
12	0.26862D+03	0.43422D+02	0.14446D+04	0.11719D-01	0.15172D+03	0.10000D+01	0.23248D+02	-0.23419D-04
13	0.26862D+03	0.43422D+02	0.14446D+04	0.11719D-01	0.15172D+03	0.18241D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11977D+05	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.97823D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.17407D+05	0.56056D+04	0.0	0.13439D+01	0.66761D+01	0.85257D+00	0.25381D+03	0.84839D+00	0.22639D+01
3	SPLITTER	0.11582D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.23862D+05	0.80072D+04	0.0	0.13398D+01	0.36126D+02	0.95605D+00	0.49649D+02	0.87570D+00	0.54399D+01
5	DUCT B	0.91754D-01	0.50000D-01	0.30000D+00	0.28025D-01	0.66156D+02	0.11201D+05	0.31005D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.23862D+05	0.80072D+04	0.10000D+01	0.35032D+01	0.67376D+00	0.50023D+04	0.96971D+00	0.90001D+00	0.23208D+01
7	TURBINE	0.17408D+05	0.56056D+04	0.10000D+01	0.23310D+01	0.55526D+00	0.46686D+04	0.65713D+00	0.89973D+00	0.20366D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10951D+01	0.11028D+01	0.80113D+03	0.51899D+03	0.65147D+03	-0.21680D-04	0.10904D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.21986D+05	0.26334D+04	0.64245D+01	0.67751D+03	0.45627D+03	0.98000D+00	0.97500D+00	0.18678D+01	0.64245D+01
11	SHAFT	0.32077D+00	0.80072D+04	0.80072D+04	0.80072D+04	0.0	0.0	0.0	0.13442D-04	0.0
12	SHAFT	-0.36224D+00	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	-0.20808D-04	0.0

MACH= 1.4000   ALTITUDE= 20000.   RECOVERY= 0.9782   3 ITERATIONS   12 PASSES

AIRFLOW (LB/SEC)	265.44	GROSS THRUST	21986.25	FUEL FLOW (LB/HR)	11201.26
NET THRUST	10009.69	TSFC	1.1190	NET THRUST/AIRFLOW	37.7103
TOTAL INLET DRAG	11976.56	TOTAL BRAKE SHAFT HP	-0.04	BOATTAIL DRAG	0.0
INSTALLED THRUST	10009.69	INSTALLED TSFC	1.1190	SPILLAGE + LIP DRAG	0.0

```
&D SPEC(7,10)=1.SPEC(4,9)=3000 &END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.78013D-07
```

CASE IDENTIFICATION AFTERBURN

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.26544D+03	0.67589D+01	0.44741D+03	0.0	0.53603D+03	0.14000D+01	0.0	0.0
2	0.26551D+03	0.21058D+02	0.[illegible]2235D+03	0.0	0.20300D+03	0.0	0.0	-0.27275D-03
3	0.26551D+03	0.47672D+02	0.61431D+03	0.0	0.10255D+03	0.0	0.0	0.0
4	0.12302D+03	0.46719D+02	0.81431D+03	0.0	0.48488D+02	0.0	0.0	0.45403D-04
5	0.14249D+03	0.46719D+02	0.81431D+03	0.0	0.56159D+02	0.37720D+00	0.42364D+02	0.0
6	0.11687D+03	0.25415D+03	0.13622D+04	0.0	0.10952D+02	0.0	0.0	0.0
7	0.61509D+01	0.22135D+03	0.13091D+04	0.0	0.0	0.0	0.0	0.0
8	0.11998D+03	0.21929D+03	0.29275D+04	0.26624D-01	0.19102D+02	0.0	0.0	-0.17908D-04
9	0.12459D+03	0.94486D+02	0.24253D+04	0.25613D-01	0.41904D+02	0.0	0.0	-0.12361D-04
10	0.12613D+03	0.46395D+02	0.20819D+04	0.25293D-01	0.80045D+02	0.37439D+00	0.42365D+02	0.0
11	0.26862D+03	0.46194D+02	0.14446D+04	0.[illegible]19D-01	0.14261D+03	0.0	0.0	0.0
12	0.27602D+03	0.43422D+02	0.30000D+04	0.39613D-01	0.22467D+03	0.10000D+01	0.23818D+02	0.0
13	0.27602D+03	0.43422D+02	0.30000D+04	0.39613D-01	0.22467D+03	0.18378D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11977D+05	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.97823D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.17409D+05	0.56056D+04	0.0	0.13439D+01	0.66761D+01	0.85257D+00	0.25381D+03	0.84839D+00	0.22639D+01
3	SPLITTER	0.11582D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.23862D+05	0.80072D+04	0.0	0.13398D 01	0.36126D+02	0.95605D+00	0.49649D+02	0.87570D+00	0.54399D+01
5	DUCT B	0.91754D-01	0.50000D-01	0.30000D+00	0.28025D-01	0.65156D+02	0.11201D+05	0.31005D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.23862D+05	0.80072D+04	0.10000D+01	0.35032D+01	0.67376D+00	0.50023D+04	0.96971D+00	0.90001D+00	0.23203D+01
7	TURBINE	0.17408D+05	0.56056D+04	0.10000D+01	0.23310D+01	0.55526D+00	0.46686D+04	0.65713D+00	0.89973D+00	0.20366D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10951D+01	0.11028D+01	0.80113D+03	0.51899D+03	0.65147D+03	-0.21680D-04	0.10904D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.27571D-01	0.0	0.26662D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.33130D+05	0.38617D+04	0.64245D+01	0.10621D+04	0.68906D+03	0.98000D+00	0.97500D+00	0.18231D+01	0.64245D+01
11	SHAFT	0.32077D+00	0.80072D+04	0.80072D+04	0.80072D+04	0.0	0.0	0.0	0.13442D-04	0.0
12	SHAFT	-0.36224D+00	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	-0.20808D-04	0.0

MACH= 1.4000 ALTITUDE= 20000. RECOVERY= 0.9782 0 ITERATIONS 1 PASSES

AIRFLOW (LB/SEC)	265.44	GROSS THRUST	33129.88	FUEL FLOW (LB/HR)	37862.82
NET THRUST	21153.32	TSFC	1.7899	NET THRUST/AIRFLOW	79.6926
TOTAL INLET DRAG	11976.56	TOTAL BRAKE SHAFT HP	-0.04	BOATTAIL DRAG	0.0
INSTALLED THRUST	21153.32	INSTALLED TSFC	1.7899	SPILLAGE + LIP DRAG	0.0

```
&D SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.0,ETAR=0 &END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.71531D-01
SUM OF (ERRORS**2)= 0.11541D-01
SUM OF (ERRORS**2)= 0.28589D-03
SUM OF (ERRORS**2)= 0.88773D-05
SUM OF (ERRORS**2)= 0.28792D-06
```

CASE IDENTIFICATION SET UP FOR AFTERBURNING

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.31145D+03	0.43727D+01	0.41184D+03	0.0	0.93270D+03	0.20000D+01	0.0	0.0
2	0.31143D+03	0.31640D+02	0.74072D+03	0.0	0.17287D+03	0.0	0.0	0.63568D-04
3	0.31143D+03	0.57198D+02	0.89736D+03	0.0	0.10525D+03	0.0	0.0	0.0
4	0.13129D+03	0.56054D+02	0.89736D+03	0.0	0.45272D+02	0.0	0.0	-0.88452D-04
5	0.18015D+03	0.56054D+02	0.89736D+03	0.0	0.62122D+02	0.42758D+00	0.49484D+02	0.0
6	0.12473D+03	0.27013D+03	0.14382D+04	0.0	0.11299D+02	0.0	0.0	0.0
7	0.65646D+01	0.23713D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12789D+03	0.23395D+03	0.29304D+04	0.25471D-01	0.19098D+02	0.0	0.0	0.10300D-03
9	0.13282D+03	0.10118D+03	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	-0.27786D-04
10	0.13446D+03	0.53457D+02	0.21186D+04	0.24197D-01	0.74706D+02	0.34541D+00	0.49474D+02	0.0
11	0.31461D+03	0.54217D+02	0.14512D+04	0.10200D-01	0.14264D+03	0.0	0.0	0.0
12	0.31461D+03	0.50964D+02	0.14512D+04	0.10200D-01	0.15174D+03	0.10000D+01	0.27280D+02	-0.19684D-04
13	0.31461D+03	0.50964D+02	0.14512D+04	0.10200D-01	0.15174D+03	0.21889D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.19260D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.92500D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16837D+05	0.52725D+04	0.0	0.15423D+01	0.18872D+02	0.73533D+00	0.25381D+03	0.85528D+00	0.18078D+01
3	SPLITTER	0.13722D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25376D+05	0.80319D+04	0.0	0.13776D+01	0.41623D+02	0.91354D+00	0.49649D+02	0.88147D+00	0.48191D+01
5	DUCT B	0.88374D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11437D+05	0.32125D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.25374D+05	0.80319D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23121D+01
7	TURBINE	0.16844D+05	0.52725D+04	0.10000D+01	0.21463D+01	0.55526D+00	0.43862D+04	0.65713D+00	0.90053D+00	0.18927D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74657D+03	0.61451D+03	0.67095D+03	0.20117D-03	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.28582D+05	0.29230D+04	0.11655D+02	0.93102D+03	0.45627D+03	0.98000D+00	0.97500D+00	0.18682D+01	0.11655D+02
11	SHAFT	-0.26895D+01	0.80319D+04	0.80319D+04	0.80319D+04	0.0	0.0	0.0	-0.10599D-03	0.0
12	SHAFT	0.77646D+01	0.52725D+04	0.52725D+04	0.52725D+04	0.0	0.0	0.0	0.46107D-03	0.0

MACH= 2.0000 ALTITUDE= 30000. RECOVERY= 0.9250 4 ITERATIONS 13 PASSES

AIRFLOW (LB/SEC)	311.45	GROSS THRUST	28582.40	FUEL FLOW (LB/HR)	11436.84
NET THRUST	9321.94	TSFC	1.2269	NET THRUST/AIRFLOW	29.9310
TOTAL INLET DRAG	19260.46	TOTAL BRAKE SHAFT HP	5.08	BOATTAIL DRAG	0.0
INSTALLED THRUST	9321.94	INSTALLED TSFC	1.2269	SPILLAGE + LIP DRAG	0.0

```
&D SPEC(7,10)=1,SPEC(4,9)=3000 &END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.28753D-06
```

CASE IDENTIFICATION   AFTERBURN

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.31145D+03	0.43727D+01	0.41184D+03	0.0	0.93270D+03	0.20000D+01	0.0	0.0
2	0.31143D+03	0.31640D+02	0.74072D+03	0.0	0.17287D+03	0.0	0.0	0.63568D-04
3	0.31143D+03	0.57198D+02	0.89736D+03	0.0	0.10525D+03	0.0	0.0	0.0
4	0.13129D+03	0.56054D+02	0.89736D+03	0.0	0.45272D+02	0.0	0.0	-0.88452D-04
5	0.18015D+03	0.56054D+02	0.89736D+03	0.0	0.62122D+02	0.42758D+00	0.49484D+02	0.0
6	0.12473D+03	0.27013D+03	0.14382D+04	0.0	0.11299D+02	0.0	0.0	0.0
7	0.65646D+01	0.23713D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12789D+03	0.23395D+03	0.29304D+04	0.25471D-01	0.19098D+02	0.0	0.0	0.10300D-03
9	0.13282D+03	0.10118D+03	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	-0.27786D-04
10	0.13446D+03	0.53457D+02	0.21186D+04	0.24197D-01	0.74706D+02	0.34541D+00	0.49474D+02	0.0
11	0.31461D+03	0.54217D+02	0.14512D+04	0.10200D-01	0.14264D+03	0.0	0.0	0.0
12	0.32322D+03	0.50964D+02	0.30000D+04	0.37869D-01	0.22415D+03	0.10000D+01	0.27944D+02	0.0
13	0.32322D+03	0.50964D+02	0.30000D+04	0.37869D-01	0.22415D+03	0.21866D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.19260D+05	0.19897D+04	0.11788D+04	0.17936D+01	0.78225D+01	0.20000D+01	0.92500D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16837D+05	0.52725D+04	0.0	0.15423D+01	0.18872D+02	0.73533D+00	0.25381D+03	0.85528D+00	0.18078D+01
3	SPLITTER	0.13722D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25376D+05	0.80319D+04	0.0	0.13776D+01	0.41623D+02	0.91354D+00	0.49649D+02	0.88147D+00	0.48191D+01
5	DUCT B	0.88374D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11437D+05	0.32125D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.25374D+05	0.80319D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23121D+01
7	TURBINE	0.16844D+05	0.52725D+04	0.10000D+01	0.21463D+01	0.55526D+00	0.43862D+04	0.65713D+00	0.90053D+00	0.18927D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74657D+03	0.61451D+03	0.67095D+03	0.20117D-03	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.27390D-01	0.0	0.31021D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.43192D+05	0.42993D+04	0.11655D+02	0.14784D+04	0.68727D+03	0.98000D+00	0.97500D+00	0.18238D+01	0.11655D+02
11	SHAFT	-0.26895D+01	0.80319D+04	0.80319D+04	0.80319D+04	0.0	0.0	0.0	-0.10599D-03	0.0
12	SHAFT	0.77646D+01	0.52725D+04	0.52725D+04	0.52725D+04	0.0	0.0	0.0	0.46107D-03	0.0

MACH= 2.0000   ALTITUDE= 30000.   RECOVERY= 0.9250   0 ITERATIONS   1 PASSES

AIRFLOW (LB/SEC)	311.45	GROSS THRUST	43191.71	FUEL FLOW (LB/HR)	42457.92
NET THRUST	23931.25	TSFC	1.7742	NET THRUST/AIRFLOW	76.8389
TOTAL INLET DRAG	19260.46	TOTAL BRAKE SHAFT HP	5.08	BOATTAIL DRAG	0.0
INSTALLED THRUST	23931.25	INSTALLED TSFC	1.7742	SPILLAGE + LIP DRAG	0.0

```
&D IWT=2,NVOPT=0,DEBUG=0 &END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.28753D-06
&W
IPLT=T,ISII=F,ISIO=F,IOUTCD=2,ILENG(1)=2,3,4,5,6,7,8,9,10,
IWMEC(1,2)='FAN ',1,1,0,3*0,
IWMEC(1,3)='SPLT',6*0,
IWMEC(1,4)='HPC ',1,0,4*0,
IWMEC(1,5)='PBUR',1,5*0,
IWMEC(1,6)='HPT ',0,4,4*0,
IWMEC(1,7)='LPT ',1,2,0,3*0,
IWMEC(1,8)='FMIX',6*0,
IWMEC(1,9)='AUG ',6*0,
IWMEC(1,10)='NOZ ',2,-9,4*0,
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IWMEC(1,11)='SHAF',2,6,3*0,4,
IWMEC(1,12)='SHAF',1,7,3*0,2,
DESVAL(1,2)=.524,1.7,.45,1.5,4.7,4.6,.45,0.,0.,1.,0.,2.,1.,
DESVAL(1,3)=15*0.,
DESVAL(1,4)=.45,1.40,.70,1.2,5.,1.5,.3,0.,0.,1.,0.,3.,1.,
DESVAL(1,5)=80.,.020,0.,4,11*0.,
DESVAL(1,6)=.5,.310,1.5,1.0,1.2,.55,150000.,3.,1.,6*0.,
DESVAL(1,7)=.55,.280,1.5,2.,3.,.6,150000.,3.,1.,6*0.,
DESVAL(1,8)=1.,12.,13*0.,
DESVAL(1,9)=250.,.018,0,8,11*0.,
DESVAL(1,10)=1.46,14*0.,
DESVAL(1,11)=50000.,.3,.85,2,7,
DESVAL(1,12)=50000.,.3,0,4,6,
&END
ATE2 - WTEST

************
*          *
*  FAN   2 *
*          *
***********2

MAX CONDITIONS OCCUR AT
***************************************
       ALT        MN        VALUE
PTOT  30000.     2.000      31.6 LB/SQIN
TTOT  30000.     2.000     740.7 DEG R
CWIN      0.     0.0       250.0 LB/SEC
***************************************
DUCT
 M NO   VEL   T TOT    P TOT    P STAT   AREA     GAM
0.524   570.   519.    2116.    1755.    6.5582   1.4005

 UTIPMAX STRESS     DEN   W/AREA    TR      H/T
 1298.3 28461.3    0.168   2.272   1.800    0.450

 COMPRESSOR  2 MECHANICAL DESIGN

 LOADING   N STG   DIAM  U TIP C    RPM     C RPM    MAX RPM
  0.865     3.00   38.83  1298.3  7663.1   7663.1   7663.1

FRAME WT  =   90.26


 STAGE    1
  WD   WB   WS   WN   WC    CL   RHOB  RHOD   AR
 61.  41.  41.   0.  19.    5.3 0.168 0.168  4.70
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I
1.5098  18.0 0.524  6.558  8.74  19.41  80 1298.3 28461.  161.  519.   519.    7004.

 STAGE    2
  WD   WB   WS   WN   WC    CL   RHOB  RHOD   AR
 89.  20.  20.  29.  13.    3.8 0.168 0.168  4.65
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB UTIPMAX  STR   WEIGHT TIN   TMAX   STAGE I
1.4375  18.0 0.499  4.809 10.79  18.35 106 1227.4 21145.  170.  594.   594.    7828.
```

```
STAGE    3
  WD   WB    WS    WN    WC    CL    RHOB  RHOD   AR
 94.   11.   11.   22.    9.    2.9 0.168 0.168  4.60
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX   STAGE I
1.3833  18.0 0.475  3.686 11.92  17.64 133 1179.5 16322.  147.  668.   668.     8347.

 N STG  WEIGHT  LENGTH  CENGRA  INERTIA
   3    569.14   14.04    7.7   23178.5

DUCT
 M NO  VEL   T TOT   P TOT   P STAT  AREA    GAM
0.475  619.  743.    6349.   5444.    2.8134  1.3944

  PR     AD EF     PO      TO      HP
 3.0000  0.8500  6348.7   743.0  19104.
  HI       HO      WI      CWI
 123.95  177.97  250.00  250.00

****************** TOTAL COMP WEIGHT IS   569.136

************
*          *
*  HPC   4 *
*          *
***********2

MAX CONDITIONS OCCUR AT
***********************************
       ALT          MN         VALUE
PTOT  30000.       2.000        56.1 LB/SQIN
TTOT  30000.       2.000       897.4 DEG R
CWIN      0.       0.0          50.9 LB/SEC
***********************************
DUCT
 M NO  VEL   T TOT   P TOT   P STAT  AREA    GAM
0.450  588.  743.    6222.   5417.    1.4944  1.3944

 UTIPMAX STRESS      DEN   W/AREA   TR      H/T
1346.0 25595.5    0.168   0.623   1.200   0.700

 COMPRESSOR  4 MECHANICAL DESIGN

 LOADING   N STG   DIAM  U TIP C    RPM    C RPM   MAX RPM
   0.652    7.00   23.18  1120.2 13256.2 11075.9 13309.0

STAGE    1
  WD   WB    WS    WN    WC    CL    RHOB  RHOD   AR
 19.    4.    4.   11.    3.    1.6 0.168 0.168  5.00
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX   STAGE I
1.3854  19.7 0.450  1.494  8.11  11.59 125 1346.0 25595.   42.  743.   743.      931.

STAGE    2
  WD   WB    WS    WN    WC    CL    RHOB  RHOD   AR
 19.    3.    3.    9.    3.    1.4 0.168 0.168  4.42
  PR   DEL H  MACH   AREA  R HUB  R TIP  NB UTIPMAX  STR    WEIGHT TIN    TMAX   STAGE I
1.3439  19.7 0.429  1.181  8.95  11.59 146 1346.0 20260.   37.  824.   824.      990.

STAGE    3
  WD   WB    WS    WN    WC    CL    RHOB  RHOD   AR
 17.    2.    2.    8.    3.    1.3 0.168 0.168  3.83
```

```
  PR   DEL H  MACH   AREA   R HUB   R TIP   NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.3107  19.7 0.407   0.961   9.50   11.59 160 1346.0 16491.    32.  904.    904.        963.

STAGE     4
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 15.    2.    2.    8.    3.     1.2 0.168 0.168   3.25
  PR   DEL H  MACH   AREA   R HUB   R TIP   NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.2834  19.7 0.386   0.800   9.88   11.59 166 1346.0 13748.    29.  984.    984.        907.

STAGE     5
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 13.    2.    2.    8.    3.     1.3 0.168 0.168   2.67
  PR   DEL H  MACH   AREA   R HUB   R TIP   NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.2608  19.7 0.364   0.681 10.15   11.59 162 1346.0 11703.    27. 1063.   1063.        847.

STAGE     6
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 12.    2.    2.    9.    3.     1.4 0.168 0.168   2.08
  PR   DEL H  MACH   AREA   R HUB   R TIP   NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.2417  19.7 0.343   0.590 10.36   11.59 147 1346.0 10149.    27. 1141.   1141.        806.

STAGE     7
  WD    WB    WS    WN    WC     CL    RHOB  RHOD    AR
 21.    3.    3.   11.    4.     1.7 0.286 0.286   1.50
  PR   DEL H  MACH   AREA   R HUB   R TIP   NB UTIPMAX  STR    WEIGHT TIN    TMAX    STAGE I
1.2253  19.7 0.321   0.521 10.51   11.59 121 1346.0 15239.    42. 1218.   1218.       1500.

 N STG   WEIGHT   LENGTH   CENGRA   INERTIA
    7    236.80     9.86     5.5     6945.0

DUCT
 M NO   VEL   T TOT    P TOT    P STAT   AREA     GAM
0.321  554. 1295.  37330.  34816.     0.4393  1.3623

  PR      AD EF     PO       TO       HP
26.0000   0.8600 37330.2  1294.7   24338.
  HI       HO      WI      CWI
 177.97   315.58  125.00    50.89

****************** TOTAL COMP WEIGHT IS   236.802

*************
*           *
*  PBUR  5  *
*           *
************2

MAX CONDITIONS OCCUR AT
****************************************
        ALT          MN        VALUE
PTOT  30000.       2.000      270.1 LB/SQIN
TTOT  30000.       2.000     1438.2 DEG R
CWIN  30000.       2.000       11.3 LB/SEC
****************************************
BURNER NUMBER     5
  RIN      ROUT      LENGTH      MACH      WSPEC
  7.776    13.650    19.200     0.046     3.874
  CAS WT   LIN WT    NOZ WT    INC WT     FRAME     WTOT
   21.9     42.6      26.7      12.5     169.2     273.0
```

```
************
*          *
*  HPT   6 *
*          *
***********2

MAX CONDITIONS OCCUR AT
***************************************
      ALT         MN        VALUE
PTOT  30000.     2.000      233.9 LB/SQIN
TTOT  30000.     2.000     2930.4 DEG R
CWOUT     0.     0.0         41.9 LB/SEC
***************************************
DUCT
 M NO  VEL  T TOT   P TOT   P STAT  AREA    GAM
0.500 1249. 2925.  32103.  27410.    0.5371  1.2867

 UTIPMAX STRESS     DEN  W/AREA   TR      H/T
 1481.3 17715.1   0.286   0.287   1.000   0.921

 TURBINE  6  MECHANICAL DESIGN
    H/T    N STG LOADING    AREA
  0.921    1.000   0.310   0.537
     UT     RTIP    RHUB   DEL H      RPM   MAXRPM  TORQ
 1475.5     12.8    11.7   140.3 13256.2 13309.0 114690.

STAGE    1
 DISK   BLADE  VANE   HWD    CASE   AR
  18.0    5.3   21.4   50.9    8.1  1.00
  PR  DEL H  MACH  AREA  R HUB  R TIP  NB MAXUTIP  STR   WEIGHT  LENGTH  STAGE I
2.3492 140.3 0.500  0.537 11.75  12.75 119 1481.3 17715.  103.76    3.53    1983.

 N STG  LENGTH  WEIGHT   CENGRA  INERTIA
   1      3.53  103.76     3.5     1983.

DUCT
 M NO  VEL  T TOT   P TOT   P STAT  AREA    GAM
0.550 1260. 2466.  13657.  11273.    1.0814  1.2964

  PR       TR     AD EF    PO       TO      TO.1
2.3507   1.1872  0.9000 13656.8   2463.6   2466.4
H IN     H OUT    AREA    FLOW     HP
797.85   657.58    6.97  122.03   24219.

****************** TOTAL TURB WEIGHT IS   103.760

************
*          *
*  LPT   7 *
*          *
***********2

MAX CONDITIONS OCCUR AT
***************************************
      ALT         MN        VALUE
PTOT  30000.     2.000      101.2 LB/SQIN
TTOT  30000.     2.000     2430.8 DEG R
```

```
CWOUT       0.       0.0          84.6 LB/SEC
**************************************
DUCT
 M NO   VEL   T TOT   P TOT   P STAT  AREA     GAM
0.550 1250. 2422.   13843.  11425.    1.0976  1.2974

 UTIPMAX STRESS      DEN  W/AREA    TR      H/T
  864.3 12002.3    0.286   0.606   1.000   0.836

 TURBINE   7  MECHANICAL  DESIGN
    H/T    N STG LOADING     AREA
  0.836    2.000   0.280    1.098
     UT     RTIP     RHUB    DEL H      RPM    MAXRPM  TORQ
  864.3     12.9     10.8    106.6   7663.1   7663.1 157143.

STAGE     1
 DISK    BLADE   VANE    HWD     CASE    AR
   9.5    15.2    60.6    45.4     8.6   2.00
  PR   DEL H   MACH   AREA   R HUB   R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
1.4534  53.3 0.550   1.098 10.80   12.92 114  864.3 12002.   139.32    3.72      2344.

STAGE     2
 DISK    BLADE   VANE    HWD     CASE    AR
  12.9    18.6    74.3    40.0     8.0   3.00
  PR   DEL H   MACH   AREA   R HUB   R TIP  NB MAXUTIP   STR    WEIGHT  LENGTH  STAGE I
1.4998  53.3 0.575   1.489 10.80   13.60 137  909.5 16282.   153.65    3.27      2966.

FRAME WT   =  192.61

 N STG  LENGTH  WEIGHT   CENGRA  INERTIA
    2    10.49  485.58     7.4     5310.

DUCT
 M NO   VEL   T TOT   P TOT   P STAT  AREA     GAM
0.600 1257. 2062.    6348.   5048.    2.0822  1.3080

  PR       TR      AD EF    PO      TO      TO.1
 2.1808   1.1751  0.9000  6347.6  2061.5  2062.2
 H IN     H OUT    AREA    FLOW     HP
 644.43   537.86   15.24  126.72  19107.

***************** TOTAL TURB WEIGHT IS   485.583


************
*          *
*  FMIX  8  *
*          *
***********2

MAX CONDITIONS OCCUR AT
**********************
       ALT          MN
PTOT  30000.       2.000
TTOT  30000.       2.000
**********************
LENGTH=  20.77 WEIGHT =  102.29
```

```
************
*          *
*  AUG   9 *
*          *
***********2

MAX CONDITIONS OCCUR AT
****************************************
       ALT          MN         VALUE
PTOT  30000.      2.000       54.2 LB/SQIN
TTOT  30000.      2.000     1451.2 DEG R
CWIN  30000.      2.000      142.6 LB/SEC
****************************************
BURNER NUMBER     9
  RIN     ROUT      LENGTH     MACH     WSPEC
   0.0     23.977   54.000    0.137    11.369
  CAS WT    LIN WT    NOZ WT   INC WT   WTOT
    38.2    134.2    329.1      0.0    501.6

************
*          *
*  NOZ  10 *
*          *
***********2

MAX CONDITIONS OCCUR AT
***********************
       ALT          MN
PTOT  30000.      2.000
TTOT  30000.      2.000
***********************
NOZZLE   10
WEIGHT=   820.83 LENGTH=   70.011 TR WT=    0.0


************
*          *
*  SHAF 12 *
*          *
***********2

MAX TORQUE CONDITION
***********************
 TORQUE
 3.2
***********************
SHAFT  12
   DO      DI    LENG     DN      WT
  3.57    0.0   32.58   0.69   97.74

TOTAL INERTIA OF THIS SPOOL IS     8928.

************
*          *
*  SHAF 11 *
*          *
***********2
```

```
MAX TORQUE CONDITION
**********************
 TORQUE
 3.2
**********************
SHAFT  11
   DO       DI    LENG      DN      WT
  4.48    3.97   19.20    1.51   19.59

TOTAL INERTIA OF THIS SPOOL IS    28489.

************
*          *
*  ACCS WT *
*          *
***********2

  ACCS WT=    0.000
```

WEIGHT INPUT DATA IN ENGL UNITS
WEIGHT OUTPUT DATA IN ENGL UNITS

COMP NO	WT EST	COMP LEN	ACCU LEN	UPSTREAM RADIUS RI	RO	RI	RO	DOWNSTREAM RADIUS RI	RO	RI	RO	NSTAGE
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0
2	569.	14.	14.	9.	19.	0.	0.	13.	17.	0.	0.	3
3	0.	0.	14.	0.	0.	0.	0.	13.	15.	15.	17.	0
4	237.	10.	24.	8.	12.	0.	0.	11.	12.	0.	0.	7
5	273.	19.	43.	8.	14.	0.	0.	8.	14.	0.	0.	0
6	104.	4.	47.	12.	13.	0.	0.	12.	14.	0.	0.	1
7	436.	10.	57.	11.	13.	0.	0.	11.	15.	0.	0.	2
8	102.	21.	78.	10.	15.	15.	18.	10.	18.	0.	0.	0
9	502.	54.	132.	0.	24.	0.	0.	0.	24.	0.	0.	0
10	821.	70.	202.	0.	24.	0.	0.	0.	22.	0.	0.	0
11	20.	0.	0.	8.	12.	8.	14.	0.	0.	0.	0.	0
12	98.	0.	0.	9.	19.	0.	0.	0.	0.	0.	0.	0

TOTAL BARE ENGINE WEIGHT= 3210.   ACCESSORIES=   0.00   ESTIMATED TOTAL LENGTH= 202.   ESTIMATED MAXIMUM RADIUS= 24.
ESTIMATED CENTER OF GRAVITY=   77.

```
                                                             AAAAAAAA)AAAAAAAAAAAAAAAAAAAAAAAAAANNNNNNNNNNNNNNNN
 CCCC                                                                )                                                  NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
 C    CCCCC                                    MMMMMMMMMMMMMMMM      )
 C        C                        PPPPTTTTTTTTTMMMMMM               )
 C  CCCCCCCCCCCPPPPPPPPP     TTTTTTTTTT      MMMMMMM                 )
 CCC      CCCCCC   PPPPPPPPPPP                 MMMMMMMMMMMMMMMM      )
                                                                     )
                                                                     )
                                                                     )
  -----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L)----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L-----C/L ------
```

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.31145D+03	0.43727D+01	0.41184D+03	0.0	0.93270D+03	0.20000D+01	0.0	0.0
2	0.31143D+03	0.31640D+02	0.74072D+03	0.0	0.17287D+03	0.0	0.0	0.63568D-04
3	0.31143D+03	0.57198D+02	0.89736D+03	0.0	0.10525D+03	0.0	0.0	0.0
4	0.13129D+03	0.56054D+02	0.89736D+03	0.0	0.45272D+02	0.0	0.0	-0.88452D-04
5	0.18015D+03	0.56054D+02	0.89736D+03	0.0	0.62122D+02	0.42758D+00	0.49484D+02	0.0
6	0.12473D+03	0.27013D+03	0.14382D+04	0.0	0.11299D+02	0.0	0.0	0.0
7	0.65646D+01	0.23713D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12789D+03	0.23395D+03	0.29304D+04	0.25471D-01	0.19098D+02	0.0	0.0	0.10300D-03
9	0.13282D+03	0.10118D+03	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	-0.27786D-04
10	0.13446D+03	0.53457D+02	0.21186D+04	0.24197D-01	0.74706D+02	0.34541D+00	0.49474D+02	0.0
11	0.31461D+03	0.54217D+02	0.14512D+04	0.10200D-01	0.14264D+03	0.0	0.0	0.0
12	0.32322D+03	0.50964D+02	0.30000D+04	0.37869D-01	0.22415D+03	0.10000D+01	0.27944D+02	0.0
13	0.32322D+03	0.50964D+02	0.30000D+04	0.37869D-01	0.22415D+03	0.21866D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.19260D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.92500D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16837D+05	0.52725D+04	0.0	0.15423D+01	0.18872D+02	0.73533D+00	0.25381D+03	0.85528D+00	0.18078D+01
3	SPLITTER	0.13722D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25376D+05	0.80319D+04	0.0	0.13776D+01	0.41623D+02	0.91354D+00	0.49649D+02	0.88147D+00	0.48191D+01
5	DUCT B	0.88374D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11437D+05	0.32125D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.25374D+05	0.80319D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23121D+01
7	TURBINE	0.16844D+05	0.52725D+04	0.10000D+01	0.21463D+01	0.55526D+00	0.43862D+04	0.65713D+00	0.90053D+00	0.18927D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74657D+03	0.61451D+03	0.67095D+03	0.20117D-03	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.27390D-01	0.0	0.31021D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.43192D+05	0.42993D+04	0.11655D+02	0.14784D+04	0.68727D+03	0.98000D+00	0.97500D+00	0.18238D+01	0.11655D+02
11	SHAFT	-0.26895D+01	0.80319D+04	0.80319D+04	0.80319D+04	0.0	0.0	0.0	-0.10599D-03	0.0
12	SHAFT	0.77646D+01	0.52725D+04	0.52725D+04	0.52725D+04	0.0	0.0	0.0	0.46107D-03	0.0

MACH= 2.0000   ALTITUDE= 30000.   RECOVERY= 0.9250   0 ITERATIONS   1 PASSES

AIRFLOW (LB/SEC)	311.45	GROSS THRUST	43191.71	FUEL FLOW (LB/HR)	42457.92
NET THRUST	23931.25	TSFC	1.7742	NET THRUST/AIRFLOW	76.8389
TOTAL INLET DRAG	19260.46	TOTAL BRAKE SHAFT HP	5.08	BOATTAIL DRAG	0.0
INSTALLED THRUST	23931.25	INSTALLED TSFC	1.7742	SPILLAGE + LIP DRAG	0.0

```
&D
IWT=0,INST=1,IFLGRF=0,AJMAX=0.,AJMIN=0.,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.33382D+00
SUM OF (ERRORS**2)= 0.17460D+00
SUM OF (ERRORS**2)= 0.70074D-01
SUM OF (ERRORS**2)= 0.12444D-01
SUM OF (ERRORS**2)= 0.72217D-03
SUM OF (ERRORS**2)= 0.32871D-03
SUM OF (ERRORS**2)= 0.30478D-04
SUM OF (ERRORS**2)= 0.10161D-04
SUM OF (ERRORS**2)= 0.24682D-05
SUM OF (ERRORS**2)= 0.58038D-06
&I
INMAP='ASF',NOZMAP='ADENAB',CFGMAP='ADENCFG',DCDMAP=0,
DERP=0,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
INSTAL - INSTLL
 1
SUM OF (ERRORS**2)= 0.58038D-06
```

```
&D
SPEC(5,10)=5556,
&END
NEP - INPUT

MODE    1 NOW BEING USED
```

```
                          OLD INSTALLATION MAPS


************
* TABLE 1  *          LOCAL MACH NUMBER (MNO)              VS       FREE STREAM MACH NUMBER (MNFS)
************

              0.0       1.000     2.000     3.000     MNO
              0.0       1.000     2.000     3.000     MNFS


************
* TABLE 2A * INLET PRESSURE RECOVERY (PT2/PT0)        VS       MASS FLOW RATIO (AO/AC)          AND     LOCAL MACH NUMBER (MNO)
************

MNO=0.600     0.490     0.500     0.600     0.700     0.750     AO/AC
              0.990     0.990     0.988     0.972     0.955     PT2/PT0

MNO=0.850     0.490     0.500     0.575     0.600     0.668     AO/AC
              0.985     0.985     0.985     0.980     0.950     PT2/PT0

MNO=1.200     0.550     0.575     0.600     0.625     0.650     0.665     AO/AC
              0.980     0.980     0.976     0.969     0.945     0.920     PT2/PT0

MNO=1.700     0.600     0.625     0.700     0.725     0.735     0.745     AO/AC
              0.955     0.955     0.950     0.938     0.925     0.864     PT2/PT0

MNO=2.200     0.720     0.750     0.775     0.790     0.805     0.825     0.835     AO/AC
              0.882     0.894     0.894     0.888     0.875     0.800     0.730     PT2/PT0

MNO=2.500     0.825     0.850     0.875     0.900     0.925     0.937     0.950     AO/AC
              0.795     0.812     0.820     0.823     0.820     0.800     0.675     PT2/PT0


************
* TABLE 2B *        OPTIMUM INLET RECOVERY (PT2/PT0 OPT)        VS       LOCAL MACH NUMBER (MNO)
************

              0.0       0.200     0.400     0.800     1.200     1.400     1.700     2.000     2.300     2.500     MNO
              0.920     0.960     0.966     0.968     0.966     0.960     0.940     0.914     0.870     0.820     PT2/PT0


************
* TABLE 2C *        OPTIMUM MASS FLOW RATIO (AO/AC OPT)         VS       LOCAL MACH NUMBER (MNO)
```

```
************
            0.0      0.600    0.800    1.000    1.200    1.400    1.600    2.000    2.000    2.500    MNO
            0.725    0.725    0.645    0.620    0.630    0.655    0.695    0.770    0.793    0.925    AO/AC

************
* TABLE 2D *          BUZZ LIMIT MASS FLOW RATIO (AO/AC)          VS        LOCAL MACH NUMBER (MNO)
************

            0.0      1.400    1.500    1.600    1.800    2.000    2.200    2.500    MNO
            0.0      0.0      0.535    0.590    0.650    0.680    0.725    0.850    AO/AC

************
* TABLE 2E *          DISTORTION LIMIT MASS FLOW RATIO (AO/AC)    VS        LOCAL MACH NUMBER (MNO)
************

            0.0      0.600    0.800    1.000    1.200    1.400    1.700    2.000    2.200    2.500    MNO
            0.730    0.730    0.650    0.635    0.640    0.668    0.725    0.780    0.815    0.955    AO/AC

************
* TABLE 3  * SPILLAGE DRAG COEFFICIENT (CDSPL)        VS       INLET MASS FLOW RATIO (AOI/AC)    AND     LOCAL MACH NUMBER (MNO)
************

MNO=0.0     0.300    0.400    0.500    0.600    0.700    0.705    0.710    0.755    0.850    0.955    AOI/AC
            0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      CDSPL

MNO=0.590   0.300    0.400    0.500    0.600    0.700    0.705    0.710    0.755    0.850    0.955    AOI/AC
            0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      CDSPL

MNO=0.600   0.300    0.400    0.500    0.600    0.700    1.000    AOI/AC
            0.140    0.105    0.069    0.035    0.0      0.0      CDSPL

MNO=0.850   0.300    0.400    0.500    0.600    0.700    1.000    AOI/AC
            0.202    0.150    0.100    0.050    0.0      0.0      CDSPL

MNO=1.200   0.300    0.400    0.500    0.600    0.700    0.705    1.000    AOI/AC
            0.315    0.235    0.156    0.080    0.020    0.0      0.0      CDSPL

MNO=1.300   0.300    0.400    0.500    0.600    0.700    0.705    0.710    1.000    AOI/AC
            0.347    0.262    0.177    0.092    0.008    0.006    0.0      0.0      CDSPL

MNO=1.700   0.300    0.400    0.500    0.600    0.700    0.705    0.710    0.755    1.000    AOI/AC
            0.850    0.660    0.475    0.290    0.104    0.097    0.087    0.0      0.0      CDSPL

MNO=2.200   0.300    0.400    0.500    0.600    0.700    0.705    0.710    0.755    0.850    1.000    AOI/AC
```

	1.100	0.887	0.696	0.497	0.298	0.291	0.280	0.190	0.0	0.0	CDSPL
MNO=2.500	0.300	0.400	0.500	0.600	0.700	0.705	0.710	0.850	0.955	1.000	AOI/AC
	1.478	1.254	1.030	0.806	0.575	0.565	0.555	0.235	0.0	0.0	CDSPL

```
************
* TABLE 3A *
************
```

REF SPILLAGE DRAG COEFF (REF CDSPL) VS LOCAL MACH NUMBER (MNO)

0.0	0.500	0.800	1.200	1.600	2.000	2.500	MNO
0.0	0.0	0.010	0.060	0.060	0.040	0.015	REF CDSPL

```
************
* TABLE 3B *
************
```

REF INLET MASS FLOW RATIO (REF AOI/AC) VS LOCAL MACH NUMBER (MNO)

0.0	0.800	1.200	1.600	2.000	2.200	2.500	MNO
0.700	0.700	0.710	0.740	0.810	0.850	0.950	REF AOI/AC


```
************
* TABLE 4  *
************
```

BLEED DRAG COEFFICIENT (CD BLD) VS BLEED MASS FLOW RATIO (AOBLD/AC) AND LOCAL MACH NUMBER (MNO)

	0.0	0.700	0.800	0.850	1.200	1.700	2.200	2.500	MNO
MNO=0.0	0.0	0.010	0.020	0.030	0.040	0.050	AOBLD/AC		
	0.0	0.0	0.0	0.0	0.0	0.0	CDBLD		
MNO=0.700	0.0	0.010	0.020	0.030	0.040	0.050	AOBLD/AC		
	0.0	0.0	0.0	0.0	0.0	0.0	CDBLD		
MNO=0.800	0.0	0.010	0.020	0.030	0.040	0.050	AOBLD/AC		
	0.0	0.006	0.012	0.017	0.023	0.029	CDBLD		
MNO=0.850	0.0	0.010	0.020	0.030	0.040	0.050	AOBLD/AC		
	0.0	0.008	0.015	0.023	0.030	0.038	CDBLD		
MNO=1.200	0.0	0.010	0.020	0.030	0.040	0.050	AOBLD/AC		
	0.0	0.010	0.021	0.031	0.041	0.052	CDBLD		
MNO=1.700	0.0	0.010	0.020	0.030	0.040	0.050	AOBLD/AC		
	0.0	0.011	0.022	0.033	0.044	0.055	CDBLD		
MNO=2.200	0.0	0.010	0.020	0.030	0.040	0.050	AOBLD/AC		

	0.0	0.014	0.028	0.043	0.057	0.071	CDBLD
MNO=2.500	0.0	0.010	0.020	0.030	0.040	0.050	AOBLD/AC
	0.0	0.017	0.034	0.051	0.068	0.082	CDBLD

****
* TABLE 5 *
****

BYPASS DRAG COEFFICIENT (CDBYP) VS BYPASS MASS FLOW RATIO (AOBYP/AC) AND LOCAL MACH NUMBER (MNO)

	0.0	0.700	1.000	1.010	1.200	1.700	2.200	2.500	MNO	
MNO=0.0	0.0	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CDBYP
MNO=0.700	0.0	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CDBYP
MNO=1.000	0.0	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CDBYP
MNO=1.010	0.0	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.045	0.082	0.135	0.350	0.565	0.780	0.995	1.210	CDBYP
MNO=1.200	0.0	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.040	0.070	0.115	0.270	0.424	0.578	0.732	0.886	CDBYP
MNO=1.700	0.0	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.025	0.050	0.085	0.205	0.450	0.650	0.850	1.050	CDBYP
MNO=2.200	0.0	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.024	0.033	0.048	0.076	0.110	0.156	0.218	0.318	CDBYP
MNO=2.500	0.0	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.018	0.027	0.039	0.063	0.092	0.129	0.180	0.268	CDBYP

****
* TABLE 6A *
****

BLEED MASS FLOW RATIO (AOBLD/AC) VS MASS FLOW RATIO (AO/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.0	0.400	0.500	0.600	0.680	0.755	0.850	0.955	AO/AC
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	AOBLD/AC

```
MNO=0.700     0.400     0.500     0.600     0.680     0.755     0.850     0.955     AO/AC
              0.0       0.0       0.0       0.0       0.0       0.0       0.0       AOBLD/AC

MNO=0.800     0.400     0.500     0.600     0.680     AO/AC
              0.136     0.011     0.006     0.0       AOBLD/AC

MNO=0.850     0.400     0.500     0.600     0.680     AO/AC
              0.017     0.013     0.008     0.0       AOBLD/AC

MNO=1.200     0.400     0.500     0.600     0.680     0.755     AO/AC
              0.024     0.018     0.009     0.001     0.0       AOBLD/AC

MNO=1.700     0.400     0.500     0.600     0.680     0.755     AO/AC
              1.130     0.081     0.049     0.024     0.0       AOBLD/AC

MNO=2.200     0.400     0.500     0.600     0.680     0.755     0.850     AO/AC
              1.630     1.278     0.092     0.063     0.034     0.0       AOBLD/AC

MNO=2.500     0.400     0.500     0.600     0.680     0.755     0.850     0.955     AO/AC
              0.205     0.205     0.205     0.205     0.205     0.093     0.0       AOBLD/AC
```



```
************
* TABLE 6B *          OPTIMUM BLEED MASS FLOW RATIO (AOBLD/AC)    VS      LOCAL MACH NUMBER (MNO)
************

              0.0       0.700     0.800     1.200     1.600     2.000     2.500     MNO
              0.0       0.0       0.006     0.009     0.014     0.020     0.030     AOBLD/AC


************
* TABLE 7  *  BYPASS MASS FLOW RATIO (AOBYP/AC)    VS    ENGINE MASS FLOW RATIO (AOE/AC)    AND    LOCAL MACH NUMBER (MNO)
************

MNO=0.0       0.0       1.000     AOE/AC
              0.0       0.0       AOBYP/AC

MNO=1.190     0.0       1.000     AOE/AC
              0.0       0.0       AOBYP/AC

MNO=1.200     0.400     0.500     0.595     AOE/AC
              0.210     0.094     0.0       AOBYP/AC
```

MNO=1.700	0.400	0.500	0.670	AOE/AC
	0.270	0.170	0.0	AOBYP/AC
MNO=2.000	0.400	0.550	0.720	AOE/AC
	0.320	0.170	0.0	AOBYP/AC
MNO=2.200	0.400	0.550	0.770	AOE/AC
	0.370	0.220	0.0	AOBYP/AC
MNO=2.500	0.400	0.600	0.920	AOE/AC
	0.520	0.320	0.0	AOBYP/AC

INLET START MACH NUMBER 3.000

MINIMUM MACH NUMBER FOR INLET DRAG CALCULATIONS 0.600

```
************
* TABLE A3 *    AFT-BODY DRAG COEFFICIENT (CD A/B)     VS     FREE STREAM MACH NUMBER (MNFS)      AND AFT-BODY AREA RATIO (A10/A9
************
```

	2.273	2.500	3.330	5.000	A10/A9						
A10/A9= 2.273	0.600	0.800	0.900	0.950	1.000	1.100	1.200	1.500	2.000	2.200	MNFS
	0.036	0.036	0.043	0.071	0.264	0.204	0.188	0.121	0.107	0.102	CD A/B
A10/A9= 2.500	0.600	0.800	0.900	0.950	1.000	1.100	1.200	1.500	2.000	2.200	MNFS
	0.035	0.035	0.043	0.068	0.258	0.203	0.188	0.128	0.113	0.108	CD A/B
A10/A9= 3.330	0.600	0.800	0.900	0.950	1.000	1.100	1.200	1.500	2.000	2.200	MNFS
	0.037	0.037	0.046	0.081	0.273	0.219	0.206	0.151	0.147	0.143	CD A/B
A10/A9= 5.000	0.600	0.800	0.900	0.950	1.000	1.100	1.200	1.500	2.000	2.200	MNFS
	0.040	0.040	0.050	0.096	0.279	0.239	0.226	0.180	0.173	0.169	CD A/B

```
************
* TABLE CFG*      GROSS THRUST COEFFICIENT (CFG)      VS      NOZZLE PRESSURE RATIO (PT9/PAMB)      AND      POWER SETTING (PS)
************

                1.000      1.500      2.000      PS

PS       1.000  2.000      4.000      6.000      8.000     10.000     12.000     PT9/PAMB
                0.945      0.970      0.988      0.990      0.985      0.984     CFG

PS       1.500  2.000      4.000      6.000      8.000     10.000     12.000     PT9/PAMB
                0.925      0.985      0.990      0.985      0.983      0.980     CFG

PS       2.000  2.000      4.000      6.000      8.000     10.000     12.000     PT9/PAMB
                0.950      0.978      0.983      0.982      0.979      0.976     CFG
```

5556 CFG MAP TITLE

```
Z  =  0.0        A9A8=  0.10000D+01
                 PTP0   0.20000D+01  0.40000D+01  0.60000D+01  0.80000D+01  0.10000D+02  0.12000D+02
                 CV     0.94500D+00  0.97000D+00  0.98750D+00  0.99000D+00  0.98500D+00  0.98400D+00
Z  =  0.0        A9A8=  0.15000D+01
                 PTP0   0.20000D+01  0.40000D+01  0.60000D+01  0.80000D+01  0.10000D+02  0.12000D+02
                 CV     0.92500D+00  0.98500D+00  0.99000D+00  0.98500D+00  0.98250D+00  0.98000D+00
Z  =  0.0        A9A8=  0.20000D+01
                 PTP0   0.20000D+01  0.40000D+01  0.60000D+01  0.80000D+01  0.10000D+02  0.12000D+02
                 CV     0.95000D+00  0.97750D+00  0.98250D+00  0.98200D+00  0.97900D+00  0.97600D+00
```

TABLE DATA INPUT SUMMARY 11 TABLES

TABLE NUMBER	REFERENCE NUMBER	ARRAY LOCATION
1	1001	1
2	1002	1075
3	1003	2149
4	1004	3223
5	1005	4459
6	1006	5695
7	1007	6931
8	1008	7384
9	1009	7978
10	1010	8431
11	5556	9172

DATA STORAGE ALLOCATION 20000
DATA STORAGE NOT USED 10747

```
SUM OF (ERRORS**2)= 0.58038D-06
ASF      0
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
ETTED AREA - NACWET
&INLWT
SLST=16200.,INLET=2,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
NLET WEIGHT - INLWT
SUM OF (ERRORS**2)= 0.11775D-02
SUM OF (ERRORS**2)= 0.39484D-06
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATL RUN
ASF	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
10000.0 FT	0.60

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1454.24 LBS/FT**2	1854.89 LBS/FT**2	483.03 DEG R	517.81 DEG R	366.47 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	10502.590
WFT (LBM/HR)	10061.496
SFC (LBM/HR/LBF)	0.958
W2 COR (LBM/SEC)	250.614
W2 ABS (LBM/SEC)	212.557
RF	0.967
CFG (PRI)	0.964
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.275
AOI/AC	0.725
AOBLD/AC	0.0
AO/AC	0.725
AOBYP/AC	0.0
AOE/AC	0.833

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.0
CD SPL (TAB 3A)	0.0
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.0
DRAG INL TOT (LBF)	0.0
CD INL REF	0.0
DRAG INL REF (LBF)	0.0
CD INL PS	0.0
DRAG INL PS (LBF)	0.0

AFTBODY DRAG

A10/A9	4.461
A10 (FT**2)	15.877
A9 (FT**2)	3.559
P9S/PAMB	1.000
CD A/B	0.030
DRAG A/B (LBF)	176.183
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.030
DRAG A/B TOT (LBF)	176.183
CD A/B REF	0.031
DRAG A/B REF (LBF)	179.861
CD A/B PS	-0.0[illegible]1
DRAG A/B PS (LBF)	-3.678

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	10506.2
WFT (LBM/HR)	10061.4
SFC (LBM/HR/LBF)	0.9
FN COR (LBF)	15288.7
WFT COR (LBM/HR)	15172.4
SFC COR (LBM/HR/LBF)	0.9

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	360.
TOTAL (LBM)	=	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	597.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	597.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	191.3
FORM (LBF)	=	13.5
TOTAL (LBF)	=	204.8

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.21549D+03	0.10108D+02	0.48303D+03	0.0	0.29821D+03	0.60000D+00	0.0	0.0
2	0.21269D+03	0.12472D+02	0.51785D+03	0.0	0.25026D+03	0.0	0.0	-0.62836D-03
3	0.21269D+03	0.37502D+02	0.74239D+03	0.0	0.99714D+02	0.0	0.0	0.0
4	0.10640D+03	0.36752D+02	0.74239D+03	0.0	0.50899D+02	0.0	0.0	0.26906D-07
5	0.10629D+03	0.36752D+02	0.74239D+03	0.0	0.50849D+02	0.33530D+00	0.34007D+02	0.0
6	0.10108D+03	0.22066D+03	0.12941D+04	0.0	0.10633D+02	0.0	0.0	0.0
7	0.53199D+01	0.19100D+03	0.12405D+04	0.0	0.0	0.0	0.0	0.0
8	0.10387D+03	0.18976D+03	0.29249D+04	0.27651D-01	0.19103D+02	0.0	0.0	0.23863D-08
9	0.10786D+03	0.81828D+02	0.24225D+04	0.26601D-01	0.41864D+02	0.0	0.0	0.16533D-07
10	0.10919D+03	0.37723D+02	0.20522D+04	0.26268D-01	0.84614D+02	0.40016D+00	0.34007D+02	0.0
11	0.21549D+03	0.37052D+02	0.14436D+04	0.13140D-01	0.14258D+03	0.0	0.0	0.0
12	0.21549D+03	0.34829D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.10000D+01	0.18653D+02	0.37504D-07
13	0.21549D+03	0.34829D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.14090D+01	0.10108D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.42707D+04	0.64644D+03	0.38298D+03	0.10721D+01	0.12759D+01	0.60000D+00	0.96700D+00	0.99842D+00	0.10000D+05
2	COMPRESR	-0.16272D+05	0.60050D+04	0.0	0.15047D+01	0.54534D+01	0.10016D+01	0.25381D+03	0.84986D+00	0.30069D+01
3	SPLITTER	0.99902D+00	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.20613D+05	0.79990D+04	0.0	0.12996D+01	0.28061D+02	0.10003D+01	0.49649D+02	0.85982D+00	0.60041D+01
5	DUCT B	0.94802D-01	0.50000D-01	0.30000D+00	0.29106D-01	0.66156D+02	0.10061D+05	0.29991D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.20613D+05	0.79990D+04	0.10000D+01	0.34998D+01	0.67376D+00	0.49994D+04	0.96971D+00	0.90000D+00	0.23190D+01
7	TURBINE	0.16272D+05	0.60050D+04	0.10000D+01	0.25013D+01	0.55526D+00	0.50042D+04	0.65713D+00	0.90000D+00	0.21692D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11093D+01	0.10807D+01	0.84902D+03	0.44216D+03	0.64832D+03	-0.33224D-07	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.14773D+05	0.22058D+04	0.34455D+01	0.51254D+03	0.45627D+03	0.98000D+00	0.96364D+00	0.18672D+01	0.34455D+01
11	SHAFT	0.11767D-02	0.79990D+04	0.79990D+04	0.79990D+04	0.0	0.0	0.0	0.57085D-07	0.0
12	SHAFT	0.10677D-02	0.60050D+04	0.60050D+04	0.60050D+04	0.0	0.0	0.0	0.65618D-07	0.0

MACH= 0.6000   ALTITUDE= 10000.   RECOVERY= 0.9670   1 ITERATIONS   10 PASSES

AIRFLOW (LB/SEC)	212.56	GROSS THRUST	14773.30	FUEL FLOW (LB/HR)	10061.50
NET THRUST	10502.59	TSFC	0.9580	NET THRUST/AIRFLOW	49.4107
TOTAL INLET DRAG	4270.71	TOTAL BRAKE SHAFT HP	0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	10502.59	INSTALLED TSFC	0.9580	SPILLAGE + LIP DRAG	0.0

```
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.19269D-01
SUM OF (ERRORS**2)= 0.43841D-04
SUM OF (ERRORS**2)= 0.12570D-05
SUM OF (ERRORS**2)= 0.11720D-02
SUM OF (ERRORS**2)= 0.78468D-05
SUM OF (ERRORS**2)= 0.70824D-07
ASF       0
```

```
       MACH 1.000          ALT 15000.                  *** WARNING MESSAGES ***
AO/AC EXCEEDS DISTORTION LIMIT.  AO/AC=  0.6369     DISTORTION LIMIT=  0.6350
SUM OF (ERRORS**2)= 0.16563D-02
SUM OF (ERRORS**2)= 0.10904D-04
SUM OF (ERRORS**2)= 0.42140D-07
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
ASF	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
15000.0 FT	1.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1192.90 LBS/FT**2	2258.08 LBS/FT**2	465.20 DEG R	558.24 DEG R	835.03 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	9827.508
WFT (LBM/HR)	10303.883
SFC (LBM/HR/LBF)	1.048
W2 COR (LBM/SEC)	229.540
W2 ABS (LBM/SEC)	227.261
RF	0.960
CFG (PRI)	0.975
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.358
AOI/AC	0.642
AOBLD/AC	0.005
AO/AC	0.637
AOBYP/AC	0.0
AOE/AC	0.637

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.040
CD SPL (TAB 3A)	0.035
CD BLD	0.004
CD BYP	0.0
CD INL TOT	0.079
DRAG INL TOT (LBF)	463.252
CD INL REF	0.035
DRAG INL REF (LBF)	204.582
CD INL PS	0.044
DRAG INL PS (LBF)	258.670

AFTBODY DRAG

A10/A9	3.986
A10 (FT**2)	15.877
A9 (FT**2)	3.983
P9S/PAMB	1.000
CD A/B	0.206
DRAG A/B (LBF)	2734.729
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.206
DRAG A/B TOT (LBF)	2734.729
CD A/B REF	0.215
DRAG A/B REF (LBF)	2851.094
CD A/B PS	-0.009
DRAG A/B PS (LBF)	-116.364

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	9685.19
WFT (LBM/HR)	10303.88
SFC (LBM/HR/LBF)	1.06
FN COR (LBF)	171[illegible]1.65
WFT COR (LBM/HR)	193[illegible]1.57
SFC COR (LBM/HR/LBF)	1.12

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	49.
FIREWALL (LBM) =	138.
COWL (LBM) =	360.
TOTAL (LBM) =	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	597.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	0.
T/O DOORS (LBM) =	0.
TOTAL (LBM) =	597.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	3210.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	395.8
FORM (LBF) =	27.9
TOTAL (LBF) =	423.7

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.23008D+03	0.82972D+01	0.46522D+03	0.0	0.38121D+03	0.10000D+01	0.0	0.0
2	0.22721D+03	0.15089D+02	0.55835D+03	0.0	0.22965D+03	0.0	0.0	0.20528D-03
3	0.22721D+03	0.40337D+02	0.77032D+03	0.0	0.10088D+03	0.0	0.0	0.0
4	0.11060D+03	0.39531D+02	0.77032D+03	0.0	0.50108D+02	0.0	0.0	-0.13100D-07
5	0.11661D+03	0.39531D+02	0.77032D+03	0.0	0.52832D+02	0.35068D+00	0.36315D+02	0.0
6	0.10507D+03	0.22906D+03	0.1[illegible]214D+04	0.0	0.10759D+02	0.0	0.0	0.0
7	0.55300D+01	0.19871D+03	0.12679D+04	0.0	0.0	0.0	0.0	0.0
8	0.10793D+03	0.19725D+03	0.29259D+04	0.27241D-01	0.19099D+02	0.0	0.0	-0.13689D-08
9	0.11208D+03	0.84924D+02	0.24229D+04	0.26206D-01	0.41919D+02	0.0	0.0	-0.14865D-08
10	0.11346D+03	0.40089D+02	0.20628D+04	0.25879D-01	0.82946D+02	0.39064D+00	0.36315D+02	0.0
11	0.23008D+03	0.39566D+02	0.14442D+04	0.12597D-01	0.14260D+03	0.0	0.0	0.0
12	0.23008D+03	0.37192D+02	0.14442D+04	0.12597D-01	0.15170D+03	0.10000D+01	0.19916D+02	-0.10868D-07
13	0.23008D+03	0.37192D+02	0.14442D+04	0.12597D-01	0.15170D+03	0.15980D+01	0.82972D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.74686D+04	0.10574D+04	0.62642D+03	0.12002D+01	0.18946D+01	0.10000D+01	0.95986D+00	0.10765D+01	0.15000D+05
2	COMPRESR	-0.16439D+05	0.57981D+04	0.0	0.13813D+01	0.42210D+01	0.93138D+00	0.25381D+03	0.85079D+00	0.26733D+01
3	SPLITTER	0.10544D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.21469D+05	0.80245D+04	0.0	0.13177D+01	0.31445D+02	0.98509D+00	0.49649D+02	0.86757D+00	0.57945D+01
5	DUCT B	0.93537D-01	0.50000D-01	0.30000D+00	0.28674D-01	0.66156D+02	0.10304D+05	0.30392D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.21469D+05	0.80245D+04	0.10000D+01	0.35068D+01	0.67376D+00	0.50144D+04	0.96971D+00	0.90009D+00	0.23227D+01
7	TURBINE	0.16439D+05	0.57981D+04	0.10000D+01	0.24360D+01	0.55526D+00	0.48313D+04	0.65713D+00	0.89994D+00	0.21184D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11039D+01	0.10885D+01	0.83137D+03	0.47042D+03	0.64842D+03	0.15361D-07	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.17296D+05	0.24187D+04	0.44825D+01	0.57355D+03	0.45527D+03	0.98000D+00	0.97525D+00	0.18674D+01	0.44825D+01
11	SHAFT	-0.23546D-04	0.80245D+04	0.80245D+04	0.80245D+04	0.0	0.0	0.0	-0.10967D-08	0.0
12	SHAFT	-0.22316D-03	0.57981D+04	0.57981D+04	0.57981D+04	0.0	0.0	0.0	-0.13575D-07	0.0

MACH= 1.0000 ALTITUDE= 15000. RECOVERY= 0.9599 2 ITERATIONS 3 PASSES

AIRFLOW (LB/SEC)	227.26	GROSS THRUST	17296.15	FUEL FLOW (LB/HR)	10303.89
NET THRUST	9827.51	TSFC	1.0485	NET THRUST/AIRFLOW	43.2432
TOTAL INLET DRAG	7468.64	TOTAL BRAKE SHAFT HP	-0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	9827.51	INSTALLED TSFC	1.0485	SPILLAGE + LIP DRAG	0.0

```
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
NEP - INPUT

MODE      1 NOW BEING USED
SUM OF (ERRORS**2)= 0.42102D-01
SUM OF (ERRORS**2)= 0.34134D-02
SUM OF (ERRORS**2)= 0.14344D-04
SUM OF (ERRORS**2)= 0.41197D-06
SUM OF (ERRORS**2)= 0.38367D-03
SUM OF (ERRORS**2)= 0.60878D-05
SUM OF (ERRORS**2)= 0.11149D-06
ASF        0
SUM OF (ERRORS**2)= 0.16562D-03
SUM OF (ERRORS**2)= 0.28400D-05
SUM OF (ERRORS**2)= 0.44652D-07
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
ASF	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
20000.0 FT	1.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
970.98 LBS/FT**2	3089.92 LBS/FT**2	447.37 DEG R	622.73 DEG R	1332.18 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	10122.129
WFT (LBM/HR)	11054.352
SFC (LBM/HR/LBF)	1.092
W2 COR (LBM/SEC)	202.980
W2 ABS (LBM/SEC)	262.077
RF	0.965
CFG (PRI)	0.989
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.349
AOI/AC	0.651
AOBLD/AC	0.019
AO/AC	0.632
AOBYP/AC	0.0
AOE/AC	0.632

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.086
CD SPL (TAB 3A)	0.060
CD BLD	0.020
CD BYP	0.0
CD INL TOT	0.166
DRAG INL TOT (LBF)	1549.157
CD INL REF	0.060
DRAG INL REF (LBF)	559.516
CD INL PS	0.106
DRAG INL PS (LBF)	989.641

AFTBODY DRAG

A10/A9	3.327
A10 (FT**2)	15.877
A9 (FT**2)	4.773
P9S/PAMB	1.000
CD A/B	0.118
DRAG A/B (LBF)	2503.615
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.118
DRAG A/B TOT (LBF)	2503.615
CD A/B REF	0.088
DRAG A/B REF (LBF)	1861.964
CD A/B PS	0.030
DRAG A/B PS (LBF)	641.650

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	8490.832
WFT (LBM/HR)	11054.352
SFC (LBM/HR/LBF)	1.302
FN COR (LBF)	18505.48
WFT COR (LBM/HR)	25942.14
SFC COR (LBM/HR/LBF)	1.402

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	360.
TOTAL (LBM)	=	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	597.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	597.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	564.8
WAVE (LBF)	=	1446.5
TOTAL (LBF)	=	2011.3

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.26509D+03	0.67589D+01	0.44741D+03	0.0	0.52924D+03	0.14000D+01	0.0	0.0
2	0.26202D+03	0.20781D+02	0.62285D+03	0.0	0.20309D+03	0.0	0.0	0.21131D-03
3	0.26202D+03	0.47046D+02	0.81430D+03	0.0	0.10255D+03	0.0	0.0	0.0
4	0.12140D+03	0.46105D+02	0.81430D+03	0.0	0.48487D+02	0.0	0.0	0.31872D-08
5	0.14062D+03	0.46105D+02	0.81430D+03	0.0	0.56160D+02	0.37720D+00	0.41807D+02	0.0
6	0.11533D+03	0.25081D+03	0.13622D+04	0.0	0.10952D+02	0.0	0.0	0.0
7	0.60702D+01	0.21845D+03	0.13091D+04	0.0	0.0	0.0	0.0	0.0
8	0.11840D+03	0.21641D+03	0.29275D+04	0.26624D-01	0.19103D+02	0.0	0.0	-0.18850D-08
9	0.12296D+03	0.93244D+02	0.24253D+04	0.25613D-01	0.41905D+02	0.0	0.0	0.14151D-08
10	0.12447D+03	0.45785D+02	0.20819D+04	0.25293D-01	0.80046D+02	0.37440D+00	0.41807D+02	0.0
11	0.26509D+03	0.45587D+02	0.14445D+04	0.11719D-01	0.14262D+03	0.0	0.0	0.0
12	0.26509D+03	0.42851D+02	0.14445D+04	0.11719D-01	0.15172D+03	0.10000D+01	0.22942D+02	-0.28553D-08
13	0.26509D+03	0.42851D+02	0.14445D+04	0.11719D-01	0.15172D+03	0.18419D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11825D+05	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.96540D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.17180D+05	0.56056D+04	0.0	0.13438D+01	0.66759D+01	0.85256D+00	0.25381D+03	0.84839D+00	0.22639D+01
3	SPLITTER	0.11583D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.23549D+05	0.80073D+04	0.0	0.13398D+01	0.36127D+02	0.95606D+00	0.49649D+02	0.87569D+00	0.54399D+01
5	DUCT B	0.91758D-01	0.50000D-01	0.30000D+00	0.28025D-01	0.66156D+02	0.11054D+05	0.31005D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.23549D+05	0.80073D+04	0.10000D+01	0.35033D+01	0.67376D+00	0.50024D+04	0.96971D+00	0.90001D+00	0.23209D+01
7	TURBINE	0.17180D+05	0.56056D+04	0.10000D+01	0.23310D+01	0.55526D+00	0.46686D+04	0.65713D+00	0.89973D+00	0.20366D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10951D+01	0.11028D+01	0.80114D+03	0.51899D+03	0.65148D+03	-0.12989D-08	0.10904D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.21947D+05	0.26637D+04	0.63400D+01	0.68725D+03	0.45627D+03	0.98000D+00	0.98895D+00	0.18678D+01	0.63400D+01
11	SHAFT	0.29123D-04	0.80073D+04	0.80073D+04	0.80073D+04	0.0	0.0	0.0	0.12367D-08	0.0
12	SHAFT	-0.42193D-03	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	-0.24560D-07	0.0

MACH= 1.4000   ALTITUDE= 20000.   RECOVERY= 0.9654   2 ITERATIONS   3 PASSES

AIRFLOW (LB/SEC)	262.08	GROSS THRUST	21947.11	FUEL FLOW (LB/HR)	11054.35
NET THRUST	10122.13	TSFC	1.0921	NET THRUST/AIRFLOW	38.6228
TOTAL INLET DRAG	11824.98	TOTAL BRAKE SHAFT HP	-0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	10122.13	INSTALLED TSFC	1.0921	SPILLAGE + LIP DRAG	0.0

```
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
NEP - INPUT
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
ASF	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
20000.0 FT	1.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
970.98 LBS/FT**2	3089.92 LBS/FT**2	447.37 DEG R	622.73 DEG R	1332.18 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	11892.078
WFT (LBM/HR)	30363.469
SFC (LBM/HR/LBF)	2.553
W2 COR (LBM/SEC)	166.656
W2 ABS (LBM/SEC)	220.212
RF	0.967
CFG (PRI)	0.990
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.355
AOI/AC	0.645
AOBLD/AC	0.021
AO/AC	0.624
AOBYP/AC	0.105
AOE/AC	0.519

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.092
CD SPL (TAB 3A)	0.060
CD BLD	0.022
CD BYP	0.192
CD INL TOT	0.366
DRAG INL TOT (LBF)	3413.107
CD INL REF	0.060
DRAG INL REF (LBF)	559.516
CD INL PS	0.306
DRAG INL PS (LBF)	2853.590

AFTBODY DRAG

A10/A9	2.743
A10 (FT**2)	15.877
A9 (FT**2)	5.787
P9S/PAMB	1.000
CD A/B	0.098
DRAG A/B (LBF)	2073.376
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.098
DRAG A/B TOT (LBF)	2073.376
CD A/B REF	0.080
DRAG A/B REF (LBF)	1691.837
CD A/B PS	0.018
DRAG A/B PS (LBF)	381.539

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	8656.94
WFT (LBM/HR)	30363.46
SFC (LBM/HR/LBF)	3.5
FN COR (LBF)	18867.52
WFT COR (LBM/HR)	71256.37
SFC COR (LBM/HR/LBF)	3.77

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	360.
TOTAL (LBM)	=	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	597.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	597.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	564.8
WAVE (LBF)	=	1446.5
TOTAL (LBF)	=	2011.3

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.18922D+03	0.67589D+01	0.44741D+03	0.0	0.44470D+03	0.14000D+01	0.0	0.0
2	0.24432D+03	0.20807D+02	0.62285D+03	0.0	0.17044D+03	0.0	0.0	-0.10382D+00
3	0.24432D+03	0.48409D+02	0.83227D+03	0.0	0.93955D+02	0.0	0.0	0.0
4	0.12568D+03	0.47441D+02	0.83227D+03	0.0	0.51905D+02	0.0	0.0	0.51130D-01
5	0.11205D+03	0.47441D+02	0.83227D+03	0.0	0.43967D+02	0.28505D+00	0.44851D+02	0.0
6	0.11940D+03	0.13771D+03	0.14378D+04	0.0	0.21213D+02	0.0	0.0	0.0
7	0.62841D+01	0.12540D+03	0.13792D+04	0.0	0.0	0.0	0.0	0.0
8	0.70399D+02	0.12901D+03	0.29304D+04	0.25476D-01	0.33151D+02	0.0	0.0	0.53973D+00
9	0.70208D+02	0.52690D+02	0.23721D+04	0.23840D-01	0.44802D+02	0.0	0.0	0.67498D-01
10	0.71779D+02	0.25856D+02	0.20270D+04	0.23306D-01	0.80650D+02	0.37726D+00	0.23572D+02	0.0
11	0.18383D+03	0.36614D+02	0.13288D+04	0.89727D-02	0.11810D+03	0.0	0.0	0.0
12	0.18922D+03	0.34417D+02	0.30000D+04	0.38570D-01	0.19431D+03	0.10000D+01	0.18874D+02	0.0
13	0.18922D+03	0.34417D+02	0.30000D+04	0.38570D-01	0.19431D+03	0.17222D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.99360D+04	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.96660D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.17535D+05	0.56056D+04	0.0	0.73989D+00	-0.33294D+01	0.85256D+00	0.25381D+03	0.80413D+00	0.23266D+01
3	SPLITTER	0.84708D+00	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.27094D+05	0.82050D+04	0.0	0.18979D+01	0.15930D+03	0.96904D+00	0.49649D+02	0.46241D+00	0.29029D+01
5	DUCT B	0.13882D-01	0.50000D-01	0.30000D+00	0.26817D-01	0.66156D+02	0.10951D+05	0.82949D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.14997D+05	0.82050D+04	0.10000D+01	0.37453D+01	0.67376D+00	0.51233D+04	0.96971D+00	0.90017D+00	0.24485D+01
7	TURBINE	0.96559D+04	0.56056D+04	0.10000D+01	0.23326D+01	0.55526D+00	0.47207D+04	0.65713D+00	0.89963D+00	0.20378D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10969D+01	0.10577D+01	0.79731D+03	0.39866D+03	0.55432D+03	0.62197D+00	0.10702D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.29334D-01	0.0	0.19413D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.21828D+05	0.37115D+04	0.50921D+01	0.83335D+03	0.59585D+03	0.98000D+00	0.98965D+00	0.18235D+01	0.50921D+01
11	SHAFT	-0.12097D+05	0.82050D+04	0.82050D+04	0.82050D+04	0.0	0.0	0.0	-0.57482D+00	0.0
12	SHAFT	-0.78786D+04	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	-0.57951D+00	0.0

MACH= 1.4000   ALTITUDE= 20000.   RECOVERY= 0.9666   51 ITERATIONS   212 PASSES

AIRFLOW (LB/SEC)	220.21	GROSS THRUST	21828.09	FUEL FLOW (LB/HR)	30363.47
NET THRUST	11892.08	TSFC	2.5533	NET THRUST/AIRFLOW	54.0030
TOTAL INLET DRAG	9936.01	TOTAL BRAKE SHAFT HP	-19976.06	BOATTAIL DRAG	0.0
INSTALLED THRUST	11892.08	INSTALLED TSFC	2.5533	SPILLAGE + LIP DRAG	0.0

* * WARNING * * FOR COMPRESSOR (COMPONENT 2) THE R VALUE IS 0.739894

ERROR PRINT *** NO CONVERGENCE

```
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,
AJMAX=0.,AJMIN=0.,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.96743D-01
SUM OF (ERRORS**2)= 0.30088D-01
SUM OF (ERRORS**2)= 0.83391D-03
SUM OF (ERRORS**2)= 0.21205D-04
SUM OF (ERRORS**2)= 0.51987D-06
SUM OF (ERRORS**2)= 0.18781D-02
SUM OF (ERRORS**2)= 0.51081D-04
SUM OF (ERRORS**2)= 0.11555D-05
SUM OF (ERRORS**2)= 0.22757D-07
ASF
       0
SUM OF (ERRORS**2)= 0.46849D-03
SUM OF (ERRORS**2)= 0.87643D-05
SUM OF (ERRORS**2)= 0.14197D-06
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
ASF	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
30000.0 FT	2.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
626.91 LBS/FT**2	4905.20 LBS/FT**2	411.70 DEG R	741.07 DEG R	1755.34 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA
INCORPORATING INLET RECOVERY
AND NOZZLE CFG

FN (LBF)	9288.930
WFT (LBM/HR)	11194.035
SFC (LBM/HR/LBF)	1.205
W2 COR (LBM/SEC)	172.921
W2 ABS (LBM/SEC)	304.983
RF	0.905
CFG (PRI)	0.984
CGF (SEC)	0.0

INLET MASS
FLOW RATIOS

AOSPL/AC	0.219
AOI/AC	0.781
AOBLD/AC	0.018
AO/AC	0.763
AOBYP/AC	0.0
AOE/AC	0.764

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.083
CD SPL (TAB 3A)	0.040
CD BLD	0.023
CD BYP	0.0
CD INL TOT	0.146
DRAG INL TOT (LBF)	1787.879
CD INL REF	0.040
DRAG INL REF (LBF)	491.495
CD INL PS	0.106
DRAG INL PS (LBF)	1296.384

AFTBODY DRAG

A10/A9	2.440
A10 (FT**2)	15.877
A9 (FT**2)	6.507
P9S/PAMB	1.000
CD A/B	0.066
DRAG A/B (LBF)	1832.329
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.066
DRAG A/B TOT (LBF)	1832.329
CD A/B REF	0.050
DRAG A/B REF (LBF)	1380.286
CD A/B PS	0.016
DRAG A/B PS (LBF)	452.043

INSTALLED ENGINE
PERFORMANCE DATA

FN (LBF)	7540.50
WFT (LBM/HR)	11194.03
SFC (LBM/HR/LBF)	1.48
FN COR (LBF)	25454.04
WFT COR (LBM/HR)	42413.55
SFC COR (LBM/HR/LBF)	1.66

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	360.
TOTAL (LBM)	=	546.

AIR INDUCTION SYSTEM
WEIGHT BREAKDOWN

INLET (LBM)	=	597.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	597.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	665.3
WAVE (LBF)	=	1905.9
TOTAL (LBF)	=	2571.2

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.30798D+03	0.43727D+01	0.41184D+03	0.0	0.91334D+03	0.20000D+01	0.0	0.0
2	0.30487D+03	0.30967D+02	0.74072D+03	0.0	0.17296D+03	0.0	0.0	0.37679D-03
3	0.30487D+03	0.55989D+02	0.89739D+03	0.0	0.10526D+03	0.0	0.0	0.0
4	0.12851D+03	0.54869D+02	0.89739D+03	0.0	0.45273D+02	0.0	0.0	0.22334D-06
5	0.17636D+03	0.54869D+02	0.89739D+03	0.0	0.62131D+02	0.42766D+00	0.48436D+02	0.0
6	0.12208D+03	0.26442D+03	0.14382D+04	0.0	0.11298D+02	0.0	0.0	0.0
7	0.64254D+01	0.23212D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12519D+03	0.22901D+03	0.29304D+04	0.25470D-01	0.19096D+02	0.0	0.0	-0.60323D-07
9	0.13001D+03	0.99044D+02	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	0.26771D-07
10	0.13162D+03	0.52334D+02	0.21186D+04	0.24197D-01	0.74697D+02	0.34536D+00	0.48436D+02	0.0
11	0.30798D+03	0.53075D+02	0.14512D+04	0.10199D-01	0.14264D+03	0.0	0.0	0.0
12	0.30798D+03	0.49890D+02	0.14512D+04	0.10199D-01	0.15174D+03	0.10000D+01	0.26705D+02	0.10674D-06
13	0.30798D+03	0.49890D+02	0.14512D+04	0.10199D-01	0.15174D+03	0.21958D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.18861D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.90533D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16486D+05	0.52731D+04	0.0	0.15427D+01	0.18874D+02	0.73541D+00	0.25381D+03	0.85530D+00	0.18080D+01
3	SPLITTER	0.13724D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.24838D+05	0.80318D+04	0.0	0.13775D+01	0.41613D+02	0.91352D+00	0.49649D+02	0.88151D+00	0.48192D+01
5	DUCT B	0.88353D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11194D+05	0.32122D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.24838D+05	0.80318D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23122D+01
7	TURBINE	0.16485D+05	0.52731D+04	0.10000D+01	0.21460D+01	0.55526D+00	0.43867D+04	0.65713D+00	0.90053D+00	0.18925D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74648D+03	0.61463D+03	0.67097D+03	-0.11655D-0[illegible]	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.28150D+05	0.29408D+04	0.11409D+02	0.93703D+03	0.45627D+03	0.98009D+00	0.98392D+00	0.18682D+01	0.11409D+02
11	SHAFT	0.15713D-02	0.80318D+04	0.80318D+04	0.80318D+04	0.0	0.0	0.0	0.63261D-07	0.0
12	SHAFT	0.11877D-01	0.52731D+04	0.52731D+04	0.52731D+04	0.0	0.0	0.0	-0.72044D-06	0.0

MACH= 2.0000   ALTITUDE= 30000.   RECOVERY= 0.9053   2 ITERATIONS   3 PASSES

AIRFLOW (LB/SEC)	304.98	GROSS THRUST	28149.65	FUEL FLOW (LB/HR)	11194.04
NET THRUST	9288.93	TSFC	1.2051	NET THRUST/AIRFLOW	30.4572
TOTAL INLET DRAG	18860.72	TOTAL BRAKE SHAFT HP	-0.01	BOATTAIL DRAG	0.0
INSTALLED THRUST	9288.93	INSTALLED TSFC	1.2051	SPILLAGE + LIP DRAG	0.0

8.2.2 DATABASE INLET 'TM1B3', DATABASE NOZZLE 'DRP1'

```
&D
IWT=0,INST=1,IFLGRF=0,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.33382D+00
SUM OF (ERRORS**2)= 0.17460D+00
SUM OF (ERRORS**2)= 0.70074D-01
SUM OF (ERRORS**2)= 0.12444D-01
SUM OF (ERRORS**2)= 0.72217D-03
SUM OF (ERRORS**2)= 0.32871D-03
SUM OF (ERRORS**2)= 0.30478D-04
SUM OF (ERRORS**2)= 0.10161D-04
SUM OF (ERRORS**2)= 0.24682D-05
SUM OF (ERRORS**2)= 0.58038D-06
&I
INMAP='TM1B3',NOZMAP='DRP1',CFGMAP='CVRP',DCDMAP=0,
DERP=0,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1..STOP=0.,
&END
INSTAL - INSTLL
 1
SUM OF (ERRORS**2)= 0.58038D-06
```

```
&D
SPEC(5,10)=5556,
&END
NEP - INPUT

MODE    1 NOW BEING USED
```

OLD INSTALLATION MAPS

****
* TABLE 1 *
****

LOCAL MACH NUMBER (MNO) VS FREE STREAM MACH NUMBER (MNFS)

0.0	1.000	2.500	MNO
0.0	1.000	2.500	MNFS

****
* TABLE 2A *
****

INLET PRESSURE RECOVERY (PT2/PT0) VS MASS FLOW RATIO (AO/AC) AND LOCAL MACH NUMBER (MNO

MNO=0.900	0.350	0.500	0.600	0.660	AO/AC			
	0.990	0.990	0.990	0.985	PT2/PT0			
MNO=1.650	0.580	0.650	0.700	0.750	0.762	0.770	0.775	AO/AC
	0.965	0.970	0.968	0.950	0.925	0.875	0.700	PT2/PT0
MNO=2.200	0.650	0.750	0.800	0.825	0.830	0.835	AO/AC	
	0.912	0.908	0.885	0.825	0.775	0.600	PT2/PT0	
MNO=2.500	0.700	0.800	0.825	0.850	0.860	0.861	AO/AC	
	0.846	0.843	0.838	0.820	0.755	0.690	PT2/PT0	

****
* TABLE 2B *
****

OPTIMUM INLET RECOVERY (PT2/PT0 OPT) VS LOCAL MACH NUMBER (MNO)

0.0	0.400	0.900	1.200	1.650	2.200	2.500	MNO
0.950	0.990	0.990	0.983	0.965	0.885	0.818	PT2/PT0

****
* TABLE 2C *
****

OPTIMUM MASS FLOW RATIO (AO/AC OPT) VS LOCAL MACH NUMBER (MNO)

0.400	0.900	1.200	1.650	2.200	2.500	MNO
0.800	0.620	0.620	0.720	0.800	0.850	AO/AC

****

```
* TABLE 2D *          BUZZ LIMIT MASS FLOW RATIO (AO/AC)        VS       LOCAL MACH NUMBER (MNO)
************

              0.0       1.400     1.650     2.200     2.500     MNO
              0.0       0.0       0.580     0.740     0.800     AO/AC


************
* TABLE 2E *          DISTORTION LIMIT MASS FLOW RATIO (AO/AC)  VS       LOCAL MACH NUMBER (MNO)
************

              0.600     0.900     1.200     1.650     2.200     2.500     MNO
              0.730     0.690     0.700     0.760     0.810     0.850     AO/AC


************
* TABLE 3  * SPILLAGE DRAG COEFFICIENT (CDSPL)      VS       INLET MASS FLOW RATIO (AOI/AC)    AND     LOCAL MACH NUMBER (MNO)
************


MNO=0.0       0.0       1.000     AOI/AC
              0.0       0.0       CDSPL

MNO=0.500     0.300     0.400     0.500     0.650     1.000     AOI/AC
              0.070     0.044     0.021     0.0       0.0       CDSPL

MNO=0.850     0.300     0.400     0.500     0.650     1.000     AOI/AC
              0.070     0.044     0.021     0.0       0.0       CDSPL

MNO=1.100     0.300     0.400     0.500     0.600     0.650     1.000     AOI/AC
              0.185     0.115     0.060     0.015     0.0       0.0       CDSPL

MNO=1.260     0.300     0.400     0.500     0.600     0.650     1.000     AOI/AC
              0.273     0.170     0.085     0.027     0.0       0.0       CDSPL

MNO=1.400     0.300     0.500     0.600     0.670     1.000     AOI/AC
              0.335     0.140     0.052     0.0       0.0       CDSPL

MNO=1.600     0.300     0.500     0.700     1.000     AOI/AC
              0.460     0.225     0.0       0.0       CDSPL

MNO=1.800     0.400     0.550     0.745     1.000     AOI/AC
              0.470     0.265     0.0       0.0       CDSPL

MNO=2.200     0.500     0.650     0.850     1.000     AOI/AC
              0.530     0.300     0.0       0.0       CDSPL

MNO=2.500     0.600     0.940     1.000     AOI/AC
```

```
            0.605     0.0       0.0       CDSPL


************
* TABLE 3A *          REF SPILLAGE DRAG COEFF (REF CDSPL)       VS       LOCAL MACH NUMBER (MHO)
************

            0.0       0.500     0.850     1.100     1.260     1.400     1.600     1.800     2.200     2.500     MNO
            0.0       0.0       0.010     0.015     0.085     0.083     0.065     0.050     0.020     0.010     REF CDSPL

************
* TABLE 3B *          REF INLET MASS FLOW RATIO (REF ADI/AC)    VS       LOCAL MACH NUMBER (MNO)
************

            0.0       0.500     0.850     1.100     1.260     1.400     1.600     1.800     2.200     2.500     MNO
            0.645     0.645     0.645     0.645     0.651     0.670     0.700     0.745     0.850     0.942     REF ADI/AC

************
* TABLE 4  *    BLEED DRAG COEFFICIENT (CD BLD)     VS     BLEED MASS FLOW RATIO (AOBLD/AC)     AND     LOCAL MACH NUMBER (MNO
************

            0.0       0.890     0.900     1.250     1.650     2.000     2.200     2.500     MNO

MNO=0.0     0.0       0.010     0.020     0.030     0.040     0.050     0.060     0.070     AOBLD/AC
            0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       CDBLD

MNO=0.890   0.0       0.010     0.020     0.030     0.040     0.050     0.060     0.070     AOBLD/AC
            0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       CDBLD

MNO=0.900   0.0       0.010     0.020     0.030     0.040     0.050     0.060     0.070     AOBLD/AC
            0.0       0.016     0.034     0.065     0.136     0.140     0.140     0.140     CDBLD

MNO=1.250   0.0       0.010     0.020     0.030     0.040     0.050     0.060     0.070     AOBLD/AC
            0.0       0.012     0.027     0.049     0.089     0.140     0.140     0.140     CDBLD

MNO=1.650   0.0       0.010     0.020     0.030     0.040     0.050     0.060     0.070     AOBLD/AC
            0.0       0.010     0.021     0.035     0.056     0.089     0.135     0.140     CDBLD

MNO=2.000   0.0       0.010     0.020     0.030     0.040     0.050     0.060     0.070     AOBLD/AC
            0.0       0.008     0.018     0.028     0.040     0.054     0.073     0.120     CDBLD

MNO=2.200   0.0       0.010     0.020     0.030     0.040     0.050     0.060     0.070     AOBLD/AC
            0.0       0.007     0.016     0.025     0.034     0.046     0.059     0.093     CDBLD

MNO=2.500   0.0       0.010     0.020     0.030     0.040     0.050     0.060     0.070     AOBLD/AC
```

0.0	0.006	0.014	0.022	0.031	0.040	0.052	0.076	CDBLD

```
************
* TABLE 5  *
************
```

BYPASS DRAG COEFFICIENT (CDBYP) VS BYPASS MASS FLOW RATIO (AOBYP/AC) AND LOCAL MACH NUMBER (MNO)

1.010 1.200 1.700 2.000 2.200 2.500 MNO

MNO=1.010	0.0	0.040	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.048	0.138	0.270	0.425	0.600	0.800	1.000	CDBYP
MNO=1.200	0.0	0.040	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.042	0.114	0.230	0.350	0.500	0.675	0.875	CDBYP
MNO=1.700	0.0	0.040	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.028	0.083	0.167	0.275	0.390	0.510	0.650	CDBYP
MNO=2.000	0.0	0.040	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.025	0.062	0.118	0.180	0.250	0.335	0.450	CDBYP
MNO=2.200	0.0	0.040	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.024	0.048	0.077	0.110	0.155	0.220	0.320	CDBYP
MNO=2.500	0.0	0.040	0.080	0.120	0.160	0.200	0.240	0.280	AOBYP/AC
	0.0	0.017	0.038	0.060	0.090	0.130	0.180	0.270	CDBYP


```
************
* TABLE 6A *
************
```

BLEED MASS FLOW RATIO (AOBLD/AC) VS MASS FLOW RATIO (AO/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.0	0.400	1.000	AO/AC
	0.0	0.0	AOBLD/AC
MNO=0.800	0.400	1.000	AO/AC
	0.0	0.0	AOBLD/AC
MNO=1.200	0.400	1.000	AO/AC
	0.019	0.0	AOBLD/AC
MNO=1.400	0.400	1.000	AO/AC
	0.028	0.0	AOBLD/AC

```
MNO=1.600      0.400     1.000     AO/AC
               0.042     0.0       AOBLD/AC

MNO=2.000      0.400     1.000     AO/AC
               0.050     0.0       AOBLD/AC

MNO=2.200      0.400     1.000     AO/AC
               0.058     0.0       AOBLD/AC

MNO=2.500      0.400     1.000     AO/AC
               0.089     0.0       AOBLD/AC


************
* TABLE 6B *            OPTIMUM BLEED MASS FLOW RATIO (AOBLD/AC)    VS       LOCAL MACH NUMBER (MNO)
************

               0.0       0.800     1.200     1.400     1.600     2.000     2.200     2.500     MNO
               0.0       0.0       0.012     0.017     0.020     0.020     0.020     0.023     AOBLD/AC


************
* TABLE 7  *    BYPASS MASS FLOW RATIO (AOBYP/AC)      VS      ENGINE MASS FLOW RATIO (AOE/AC)     AND     LOCAL MACH NUMBER (MNO)
************

MNO=0.0        0.300     1.000     AOE/AC
               0.0       0.0       AOBYP/AC

MNO=1.190      0.300     1.000     AOE/AC
               0.0       0.0       AOBYP/AC

MNO=1.200      0.300     0.620     1.000     AOE/AC
               0.320     0.0       0.0       AOBYP/AC

MNO=1.400      0.300     0.625     1.000     AOE/AC
               0.325     0.0       0.0       AOBYP/AC

MNO=1.650      0.300     0.720     1.000     AOE/AC
               0.420     0.0       0.0       AOBYP/AC

MNO=2.000      0.300     0.760     1.000     AOE/AC
               0.460     0.0       0.0       AOBYP/AC
```

```
MNO=2.200      0.300     0.800     1.000     AOE/AC
               0.500     0.0       0.0       AOBYP/AC

MNO=2.500      0.300     0.850     1.000     AOE/AC
               0.550     0.0       0.0       AOBYP/AC


INLET START MACH NUMBER 3.000

MINIMUM MACH NUMBER FOR INLET DRAG CALCULATIONS  0.900
```

```
************
* TABLE AB *     AFT-BODY DRAG COEFFICIENT (CD A/B)     VS     FREE STREAM MACH NUMBER (MNFS)     AND AFT-BODY AREA RATIO (A10/A9)
************
```

	1.850	2.000	2.500	3.330	5.000	10.000	A10/A9			
A10/A9= 1.850	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.013	0.015	0.024	0.119	0.078	0.066	0.046	0.044	0.042	CD A/B
A10/A9= 2.000	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.014	0.017	0.026	0.130	0.088	0.075	0.052	0.052	0.050	CD A/B
A10/A9= 2.500	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.017	0.020	0.031	0.146	0.093	0.078	0.057	0.056	0.054	CD A/B
A10/A9= 3.330	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.020	0.024	0.037	0.174	0.113	0.095	0.067	0.065	0.063	CD A/B
A10/A9= 5.000	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.023	0.028	0.042	0.210	0.140	0.119	0.083	0.082	0.080	CD A/B
A10/A9=10.000	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.027	0.033	0.049	0.260	0.177	0.150	0.104	0.103	0.101	CD A/B

****
* TABLE CFG*
****

GROSS THRUST COEFFICIENT (CFG) VS NOZZLE PRESSURE RATIO (PT9/PAMB) AND NOZZLE AREA RATIO (A9/A8)

1.730 1.970 2.630 3.283 A9/A8

A9/A8	1.730	1.500	2.000	3.000	4.000	5.000	6.500	8.500	11.000	16.000	20.000	PT9/PAMB
		0.860	0.910	0.960	0.985	0.987	0.984	0.988	0.984	0.974	0.965	CFG
A9/A8	1.970	1.500	2.000	3.000	4.000	5.000	6.500	8.500	11.000	16.000	20.000	PT9/PAMB
		0.894	0.930	0.968	0.980	0.982	0.971	0.980	0.982	0.976	0.968	CFG
A9/A8	2.630	1.500	2.000	3.000	4.000	5.000	6.500	8.500	11.000	16.000	20.000	PT9/PAMB
		0.928	0.940	0.972	0.973	0.969	0.959	0.948	0.966	0.974	0.973	CFG
A9/A8	3.283	1.500	2.000	3.000	4.000	5.000	6.500	8.500	11.000	16.000	20.000	PT9/PAMB
		0.952	0.969	0.972	0.963	0.955	0.952	0.918	0.942	0.965	0.970	CFG

```
Z    =  0.0        A9A8=  0.17300D+01
                   PTP0   0.15000D+01   0.20000D+01   0.30000D+01   0.40000D+01   0.50000D+01   0.65000D+01   0.85000D+01   0.11000D+02
                   CV     0.86000D+00   0.91000D+00   0.96000D+00   0.98500D+00   0.98700D+00   0.98450D+00   0.98800D+00   0.98000D+00
                   PTP0   0.16000D+02   0.20000D+02
                   CV     0.97000D+00   0.96000D+00
Z    =  0.0        A9A8=  0.19700D+01
                   PTP0   0.15000D+01   0.20000D+01   0.30000D+01   0.40000D+01   0.50000D+01   0.65000D+01   0.85000D+01   0.11000D+02
                   CV     0.89400D+00   0.93000D+00   0.96800D+00   0.98000D+00   0.98200D+00   0.97100D+00   0.98000D+00   0.98000D+00
                   PTP0   0.16000D+02   0.20000D+02
                   CV     0.98000D+00   0.97000D+00
Z    =  0.0        A9A8=  0.26300D+01
                   PTP0   0.15000D+01   0.20000D+01   0.30000D+01   0.40000D+01   0.50000D+01   0.65000D+01   0.85000D+01   0.11000D+02
                   CV     0.92800D+00   0.94000D+00   0.97200D+00   0.97300D+00   0.96900D+00   0.95900D+00   0.94800D+00   0.97000D+00
                   PTP0   0.16000D+02   0.20000D+02
                   CV     0.97000D+00   0.97000D+00
Z    =  0.0        A9A8=  0.32800D+01
                   PTP0   0.15000D+01   0.20000D+01   0.30000D+01   0.40000D+01   0.50000D+01   0.65000D+01   0.85000D+01   0.11000D+02
                   CV     0.95200D+00   0.96900D+00   0.97200D+00   0.96300D+00   0.95500D+00   0.95200D+00   0.91800D+00   0.94000D+00
                   PTP0   0.16000D+02   0.20000D+02
                   CV     0.96000D+00   0.97000D+00
```

TABLE DATA INPUT SUMMARY 11 TABLES

TABLE NUMBER	REFERENCE NUMBER	ARRAY LOCATION
1	1001	1
2	1002	1075
3	1003	2149
4	1004	3223
5	1005	4459
6	1006	5695
7	1007	6931
8	1008	7384
9	1009	7978
10	1010	8431
11	5556	9172

DATA STORAGE ALLOCATION 20000
DATA STORAGE NOT USED 10675

```
SUM OF (ERRORS**2)= 0.58038D-06
TM1B3     0
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6.7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
ETTED AREA - NACWET
&INLWT
SLST=16200.,INLET=5,QMAX=1800.,NINLET=1,K'4APE=1.,
LDUCTS=0.,BDOOR=0.,TDOOR=0.,
&END
HLET WEIGHT - INLWT
SUM OF (ERRORS**2)= 0.11689D-03
SUM OF (ERRORS**2)= 0.41871D-08
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
TM1B3	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
10000.0 FT	0.60

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1454.24 LBS/FT**2	1854.89 LBS/FT**2	483.03 DEG R	517.81 DEG R	366.47 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	11110.230
WFT (LBM/HR)	10300.812
SFC (LBM/HR/LBF)	0.927
W2 COR (LBM/SEC)	250.614
W2 ABS (LBM/SEC)	217.736
RF	0.990
CFG (PRI)	0.979
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.272
AOI/AC	0.728
AOBLD/AC	0.0
AO/AC	0.728
AOBYP/AC	0.0
AOE/AC	0.852

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.0
CD SPL (TAB 3A)	0.0
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.0
DRAG INL TOT (LBF)	0.0
CD INL REF	0.0
DRAG INL REF (LBF)	0.0
CD INL PS	0.0
DRAG INL PS (LBF)	0.0

AFTBODY DRAG

A10/A9	4.371
A10 (FT**2)	15.877
A9 (FT**2)	3.632
P9S/PAMB	1.000
CD A/B	0.017
DRAG A/B (LBF)	100.349
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.017
DRAG A/B TOT (LBF)	100.349
CD A/B REF	0.011
DRAG A/B REF (LBF)	64.001
CD A/B PS	0.006
DRAG A/B PS (LBF)	36.347

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	11073.88
WFT (LBM/HR)	10300.81
SFC (LBM/HR/LBF)	0.93
FN COR (LBF)	16114.77
WFT COR (LBM/HR)	15533.29
SFC COR (LBM/HR/LBF)	0.96

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	49.
FIREWALL (LBM) =	138.
COWL (LBM) =	427.
TOTAL (LBM) =	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	261.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	0.
T/O DOORS (LBM) =	0.
TOTAL (LBM) =	261.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	193.1
FORM (LBF) =	13.6
TOTAL (LBF) =	206.7

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	3210.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	3210.

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.22061D+03	0.10108D+02	0.48303D+03	0.0	0.30548D+03	0.60000D+00	0.0	0.0
2	0.21775D+03	0.12768D+02	0.51785D+03	0.0	0.25040D+03	0.0	0.0	-0.64708D-04
3	0.21775D+03	0.38394D+02	0.74239D+03	0.0	0.99714D+02	0.0	0.0	0.0
4	0.10893D+03	0.37626D+02	0.74239D+03	0.0	0.50899D+02	0.0	0.0	0.26906D-07
5	0.10882D+03	0.37626D+02	0.74239D+03	0.0	0.50849D+02	0.33530D+00	0.34816D+02	0.0
6	0.10348D+03	0.22591D+03	0.12941D+04	0.0	0.10633D+02	0.0	0.0	0.0
7	0.54464D+01	0.19554D+03	0.12405D+04	0.0	0.0	0.0	0.0	0.0
8	0.10634D+03	0.19427D+03	0.29249D+04	0.27651D-01	0.19103D+02	0.0	0.0	0.23863D-08
9	0.11043D+03	0.83774D+02	0.24225D+04	0.26601D-01	0.41864D+02	0.0	0.0	0.16533D-07
10	0.11179D+03	0.38620D+02	0.20522D+04	0.26268D-01	0.84614D+02	0.40016D+00	0.34816D+02	0.0
11	0.22061D+03	0.37933D+02	0.14436D+04	0.13140D-01	0.14258D+03	0.0	0.0	0.0
12	0.22061D+03	0.35657D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.10000D+01	0.19096D+02	0.37504D-07
13	0.22061D+03	0.35657D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.14469D+01	0.10108D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.43748D+04	0.64644D+03	0.38298D+03	0.10721D+01	0.12759D+01	0.60000D+00	0.99000D+00	0.99842D+00	0.10000D+05
2	COMPRESR	-0.16659D+05	0.60050D+04	0.0	0.15047D+01	0.14534D+01	0.10016D+01	0.25381D+03	0.84986D+00	0.30069D+01
3	SPLITTER	0.99902D+00	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.21104D+05	0.79990D+04	0.0	0.12996D+01	0.28061D+02	0.10003D+01	0.49649D+02	0.85982D+00	0.60041D+01
5	DUCT B	0.94802D-01	0.50000D-01	0.30000D+00	0.29106D-01	0.66156D+02	0.10301D+05	0.29991D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.21104D+05	0.79990D+04	0.10000D+01	0.34998D+01	0.67376D+00	0.49994D+04	0.96971D+00	0.90000D+00	0.23190D+01
7	TURBINE	0.16659D+05	0.60050D+04	0.10000D+01	0.25013D+01	0.55526D+00	0.50042D+04	0.65713D+00	0.90000D+00	0.21692D+01
8	MIXER	0.10389D+03	0.27387D+03	0.11093D+01	0.10807D+01	0.84902D+03	0.44216D+03	0.64832D+03	-0.33224D-07	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.15485D+05	0.22583D+04	0.35275D+01	0.52301D+03	0.45627D+03	0.98000D+00	0.97880D+00	0.18672D+01	0.35275D+01
11	SHAFT	0.12047D-02	0.79990D+04	0.79990D+04	0.79990D+04	0.0	0.0	0.0	0.57085D-07	0.0
12	SHAFT	0.10931D-02	0.60050D+04	0.60050D+04	0.60050D+04	0.0	0.0	0.0	0.65618D-07	0.0

MACH= 0.6000   ALTITUDE= 10000.   RECOVERY= 0.9900   1 ITERATIONS   10 PASSES

AIRFLOW (LB/SEC)	217.74	GROSS THRUST	15484.99	FUEL FLOW (LB/HR)	10300.81
NET THRUST	11110.23	TSFC	0.9271	NET THRUST/AIRFLOW	51.0263
TOTAL INLET DRAG	4374.76	TOTAL BRAKE SHAFT HP	0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	11110.23	INSTALLED TSFC	0.9271	SPILLAGE + LIP DRAG	0.0

```
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.19131D-01
SUM OF (ERRORS**2)= 0.43999D-04
SUM OF (ERRORS**2)= 0.12539D-05
SUM OF (ERRORS**2)= 0.11566D-03
SUM OF (ERRORS**2)= 0.59992D-06
TM1B3     0
SUM OF (ERRORS**2)= 0.37680D-03
SUM OF (ERRORS**2)= 0.17138D-05
SUM OF (ERRORS**2)= 0.57226D-08
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
TM1B3	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
15000.0 FT	1.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1192.90 LBS/FT**2	2258.08 LBS/FT**2	465.20 DEG R	558.24 DEG R	835.03 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG		INLET MASS FLOW RATIOS		INLET DRAG		AFTBODY DRAG		INSTALLED ENGINE PERFORMANCE DATA	
FN (LBF)	10517.996	AOSPL/AC	0.345	AC (FT**2)	7.000	A10/A9	3.857	FN (LBF)	9153.2
WFT (LBM/HR)	10520.316	AOI/AC	0.655	CD SPL (TAB 3)	0.0	A10 (FT**2)	15.877	WFT (LBM/HR)	10520.3
SFC (LBM/HR/LBF)	1.000	AOBLD/AC	0.006	CD SPL (TAB 3A)	0.013	A9 (FT**2)	4.116	SFC (LBM/HR/LBF)	1.1
W2 COR (LBM/SEC)	229.433	AO/AC	0.650	CD BLD	0.008	P9S/PAMB	1.000		
W2 ABS (LBM/SEC)	232.005	AOBYP/AC	0.0	CD BYP	0.0	CD A/B	0.185	FN COR (LBF)	16238.0
		AOE/AC	0.650	CD INL TOT	0.021	DRAG A/B (LBF)	2457.406	WFT COR (LBM/HR)	19707.0
RF	0.980			DRAG INL TOT (LBF)	123.445	CD A/B SPR	0.0	SFC COR (LBM/HR/LBF)	1.2
CFG (PRI)	0.996			CD INL REF	0.013	DRAG A/B SPR (LBF)	0.0		
CGF (SEC)	0.0			DRAG INL REF (LBF)	75.988	CD A/B TOT	0.185		
				CD INL PS	0.008	DRAG A/B TOT (LBF)	2457.406		
				DRAG INL PS (LBF)	47.457	CD A/B REF	0.086		
						DRAG A/B REF (LBF)	1140.143		
						CD A/B PS	0.099		
						DRAG A/B PS (LBF)	1317.264		

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	427.
TOTAL (LBM)	=	613.

AIR INDUCTION SYSTEM
WEIGHT BREAKDOWN

INLET (LBM)	=	261.
DUCT (LBM)	=	0.
BYPAS, DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	261.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	399.3
FORM (LBF)	=	28.2
TOTAL (LBF)	=	427.5

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.23491D+03	0.82972D+01	0.46522D+03	0.0	0.38917D+03	0.10000D+01	0.0	0.0
2	0.23199D+03	0.15406D+02	0.55835D+03	0.0	0.22962D+03	0.0	0.0	0.75647D-04
3	0.23199D+03	0.41185D+02	0.77032D+03	0.0	0.10088D+03	0.0	0.0	0.0
4	0.11292D+03	0.40361D+02	0.77032D+03	0.0	0.50108D+02	0.0	0.0	0.10805D-06
5	0.11906D+03	0.40361D+02	0.77032D+03	0.0	0.52832D+02	0.35068D+00	0.37078D+02	0.0
6	0.10728D+03	0.23387D+03	0.13214D+04	0.0	0.10759D+02	0.0	0.0	0.0
7	0.56462D+01	0.20288D+03	0.12679D+04	0.0	0.0	0.0	0.0	0.0
8	0.11020D+03	0.20140D+03	0.29259D+04	0.27241D-01	0.19099D+02	0.0	0.0	-0.10104D-06
9	0.11443D+03	0.86708D+02	0.24229D+04	0.26206D-01	0.41919D+02	0.0	0.0	0.17211D-07
10	0.11585D+03	0.40931D+02	0.20628D+04	0.25879D-01	0.82946D+02	0.39064D+00	0.37078D+02	0.0
11	0.23491D+03	0.40397D+02	0.14442D+04	0.12597D-01	0.14260D+03	0.0	0.0	0.0
12	0.23491D+03	0.37974D+02	0.14442D+04	0.12597D-01	0.15170D+03	0.10000D+01	0.20335D+02	0.48974D-07
13	0.23491D+03	0.37974D+02	0.14442D+04	0.12597D-01	0.15170D+03	0.16462D+01	0.82972D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.76245D+04	0.10574D+04	0.62642D+03	0.12002D+01	0.18946D+01	0.10000D+01	0.98002D+00	0.10765D+01	0.15000D+05
2	COMPRESR	-0.16784D+05	0.57981D+04	0.0	0.13813D+01	0.42210D+01	0.93138D+00	0.25381D+03	0.85079D+00	0.26733D+01
3	SPLITTER	0.10544D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.21920D+05	0.80245D+04	0.0	0.13177D+01	0.31445D+02	0.98509D+00	0.49649D+02	0.86757D+00	0.57945D+01
5	DUCT B	0.93537D-01	0.50000D-01	0.30000D+00	0.28674D-01	0.66156D+02	0.10520D+05	0.30392D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.21920D+05	0.80245D+04	0.10000D+01	0.35068D+01	0.67376D+00	0.50144D+04	0.96971D+00	0.90009D+00	0.23227D+01
7	TURBINE	0.16784D+05	0.57981D+04	0.10000D+01	0.24360D+01	0.55526D+00	0.48313D+04	0.65713D+00	0.89994D+00	0.21184D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11039D+01	0.10885D+01	0.83137D+03	0.47042D+03	0.64842D+03	-0.27597D-06	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.18143D+05	0.24849D+04	0.45767D+01	0.59275D+03	0.45627D+03	0.98000D+00	0.99634D+00	0.18674D+01	0.45767D+01
11	SHAFT	0.25273D-02	0.80245D+04	0.80245D+04	0.80245D+04	0.0	0.0	0.0	0.11529D-06	0.0
12	SHAFT	-0.85314D-03	0.57981D+04	0.57981D+04	0.57981D+04	0.0	0.0	0.0	-0.50831D-07	0.0

MACH= 1.0000   ALTITUDE= 15000.   RECOVERY= 0.9800   2 ITERATIONS   3 PASSES

AIRFLOW (LB/SEC)	232.00	GROSS THRUST	18142.53	FUEL FLOW (LB/HR)	10520.32
NET THRUST	10518.00	TSFC	1.0002	NET THRUST/AIRFLOW	45.3352
TOTAL INLET DRAG	7624.53	TOTAL BRAKE SHAFT HP	0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	10518.00	INSTALLED TSFC	1.0002	SPILLAGE + LIP DRAG	0.0

```
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.42150D-01
SUM OF (ERRORS**2)= 0.34341D-02
SUM OF (ERRORS**2)= 0.14437D-04
SUM OF (ERRORS**2)= 0.41508D-06
SUM OF (ERRORS**2)= 0.14531D-05
SUM OF (ERRORS**2)= 0.23520D-07
TM1B3     0
SUM OF (ERRORS**2)= 0.85688D-05
SUM OF (ERRORS**2)= 0.11655D-06
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
TM1B3	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
20000.0 FT	1.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
970.98 LBS/FT**2	3089.92 LBS/FT**2	447.37 DEG R	622.73 DEG R	1332.18 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	10498.672
WFT (LBM/HR)	11170.246
SFC (LBM/HR/LBF)	1.064
W2 COR (LBM/SEC)	203.078
W2 ABS (LBM/SEC)	264.859
RF	0.976
CFG (PRI)	0.999
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.345
AOI/AC	0.655
AOBLD/AC	0.017
AO/AC	0.638
AOBYP/AC	0.0
AOE/AC	0.639

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.011
CD SPL (TAB 3A)	0.083
CD BLD	0.021
CD BYP	0.0
CD INL TOT	0.115
DRAG INL TOT (LBF)	1070.002
CD INL REF	0.083
DRAG INL REF (LBF)	773.999
CD INL PS	0.032
DRAG INL PS (LBF)	296.004

AFTBODY DRAG

A10/A9	3.259
A10 (FT**2)	15.877
A9 (FT**2)	4.871
P9S/PAMB	1.000
CD A/B	0.102
DRAG A/B (LBF)	2166.280
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.102
DRAG A/B TOT (LBF)	2166.280
CD A/B REF	0.043
DRAG A/B REF (LBF)	920.051
CD A/B PS	0.059
DRAG A/B PS (LBF)	1246.229

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	8956.4
WFT (LBM/HR)	11170.2
SFC (LBM/HR/LBF)	1.2
FN COR (LBF)	19520.2
WFT COR (LBM/HR)	26214.1
SFC COR (LBM/HR/LBF)	1.3

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	49.
FIREWALL (LBM) =	138.
COWL (LBM) =	427.
TOTAL (LBM) =	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	261.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	0.
T/O DOORS (LBM) =	0.
TOTAL (LBM) =	261.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	3210.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	569.9
WAVE (LBF) =	1266.9
TOTAL (LBF) =	1836.8

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.26787D+03	0.67589D+01	0.44741D+03	0.0	0.53486D+03	0.14000D+01	0.0	0.0
2	0.26477D+03	0.20999D+02	0.62285D+03	0.0	0.20312D+03	0.0	0.0	0.34139D-03
3	0.26477D+03	0.47539D+02	0.81430D+03	0.0	0.10255D+03	0.0	0.0	0.0
4	0.12268D+03	0.46589D+02	0.81430D+03	0.0	0.48487D+02	0.0	0.0	0.25417D-06
5	0.14209D+03	0.46589D+02	0.81430D+03	0.0	0.56160D+02	0.37720D+00	0.42246D+02	0.0
6	0.11654D+03	0.25344D+03	0.13622D+04	0.0	0.10952D+02	0.0	0.0	0.0
7	0.61338D+01	0.22074D+03	0.13091D+04	0.0	0.0	0.0	0.0	0.0
8	0.11965D+03	0.21867D+03	0.29275D+04	0.26624D-01	0.19103D+02	0.0	0.0	-0.17410D-06
9	0.12425D+03	0.94222D+02	0.24253D+04	0.25613D-01	0.41905D+02	0.0	0.0	0.14819D-06
10	0.12578D+03	0.46265D+02	0.20819D+04	0.25293D-01	0.80046D+02	0.37440D+00	0.42246D+02	0.0
11	0.26787D+03	0.46065D+02	0.14445D+04	0.11719D-01	0.14262D+03	0.0	0.0	0.0
12	0.26787D+03	0.43301D+02	0.14445D+04	0.11719D-01	0.15172D+03	0.10000D+01	0.23183D+02	-0.60337D-06
13	0.26787D+03	0.43301D+02	0.14445D+04	0.11719D-01	0.15172D+03	0.18670D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11951D+05	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.97552D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.17360D+05	0.56056D+04	0.0	0.13438D+01	0.66759D+01	0.85256D+00	0.25381D+03	0.84839D+00	0.22639D+01
3	SPLITTER	0.11583D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.23796D+05	0.80073D+04	0.0	0.13398D+01	0.36127D+02	0.95606D+00	0.49649D+02	0.87569D+00	0.54399D+01
5	DUCT B	0.91758D-01	0.50000D-01	0.30000D+00	0.28025D-01	0.66156D+02	0.11170D+05	0.31005D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.23796D+05	0.80073D+04	0.10000D+01	0.35033D+01	0.67376D+00	0.50024D+04	0.96971D+00	0.90001D+00	0.23209D+01
7	TURBINE	0.17360D+05	0.56056D+04	0.10000D+01	0.23310D+01	0.55526D+00	0.46686D+04	0.65713D+00	0.89973D+00	0.20366D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10951D+01	0.11028D+01	0.80114D+03	0.51899D+03	0.65148D+03	-0.23222D-06	0.10904D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.22449D+05	0.26964D+04	0.64065D+01	0.70147D+03	0.45627D+03	0.98000D+00	0.99890D+00	0.18678D+01	0.64065D+01
11	SHAFT	0.36876D-02	0.80073D+04	0.80073D+04	0.80073D+04	0.0	0.0	0.0	0.15496D-06	0.0
12	SHAFT	-0.25298D-01	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	-0.14573D-05	0.0

MACH= 1.4000   ALTITUDE= 20000.   RECOVERY= 0.9755   1 ITERATIONS   2 PASSES

AIRFLOW (LB/SEC)	264.86	GROSS THRUST	22449.18	FUEL FLOW (LB/HR)	11170.25
NET THRUST	10498.68	TSFC	1.0640	NET THRUST/AIRFLOW	39.6388
TOTAL INLET DRAG	11950.51	TOTAL BRAKE SHAFT HP	-0.02	BOATTAIL DRAG	0.0
INSTALLED THRUST	10498.68	INSTALLED TSFC	1.0640	SPILLAGE + LIP DRAG	0.0

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&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
NEP - INPUT
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INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
TM1B3	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
20000.0 FT	1.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
970.98 LBS/FT**2	3089.92 LBS/FT**2	447.37 DEG R	622.73 DEG R	1332.18 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	21705.715
WFT (LBM/HR)	37752.645
SFC (LBM/HR/LBF)	1.739
W2 COR (LBM/SEC)	204.992
W2 ABS (LBM/SEC)	264.859
RF	0.975
CFG (PRI)	0.994
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.339
AOI/AC	0.661
AOBLD/AC	0.017
AO/AC	0.644
AOBYP/AC	0.0
AOE/AC	0.645

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.007
CD SPL (TAB 3A)	0.083
CD BLD	0.020
CD BYP	0.0
CD INL TOT	0.110
DRAG INL TOT (LBF)	1029.410
CD INL REF	0.083
DRAG INL REF (LBF)	773.999
CD INL PS	0.027
DRAG INL PS (LBF)	255.411

AFTBODY DRAG

A10/A9	2.089
A10 (FT**2)	15.877
A9 (FT**2)	7.601
P9S/PAMB	1.000
CD A/B	0.082
DRAG A/B (LBF)	1738.791
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.082
DRAG A/B TOT (LBF)	1738.791
CD A/B REF	0.043
DRAG A/B REF (LBF)	920.051
CD A/B PS	0.039
DRAG A/B PS (LBF)	818.740

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	20631.55
WFT (LBM/HR)	37752.64
SFC (LBM/HR/LBF)	1.83
FN COR (LBF)	44965.79
WFT COR (LBM/HR)	88597.18
SFC COR (LBM/HR/LBF)	1.97

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	427.
TOTAL (LBM)	=	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	261.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	261.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	569.9
WAVE (LBF)	=	1266.9
TOTAL (LBF)	=	1836.8

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.27522D+03	0.67589D+01	0.44741D+03	0.0	0.53486D+03	0.14000D+01	0.0	0.0
2	0.26473D+03	0.20996D+02	0.62285D+03	0.0	0.20315D+03	0.0	0.0	0.48101D-03
3	0.26473D+03	0.47533D+02	0.81430D+03	0.0	0.10255D+03	0.0	0.0	0.0
4	0.12266D+03	0.46582D+02	0.81430D+03	0.0	0.48487D+02	0.0	0.0	0.25417D-06
5	0.14207D+03	0.46582D+02	0.81430D+03	0.0	0.56160D+02	0.37720D+00	0.42240D+02	0.0
6	0.11653D+03	0.25340D+03	0.13622D+04	0.0	0.10952D+02	0.0	0.0	0.0
7	0.61330D+01	0.22071D+03	0.13091D+04	0.0	0.0	0.0	0.0	0.0
8	0.11963D+03	0.21864D+03	0.29275D+04	0.26624D-01	0.19103D+02	0.0	0.0	-0.17410D-06
9	0.12423D+03	0.94209D+02	0.24253D+04	0.25613D-01	0.41905D+02	0.0	0.0	0.14819D-06
10	0.12576D+03	0.46258D+02	0.20819D+04	0.25293D-01	0.80046D+02	0.37440D+00	0.42240D+02	0.0
11	0.26783D+03	0.46058D+02	0.14445D+04	0.11719D-01	0.14262D+03	0.0	0.0	0.0
12	0.27522D+03	0.43295D+02	0.30000D+04	0.39613D-01	0.22467D+03	0.10000D+01	0.23748D+02	0.0
13	0.27522D+03	0.43295D+02	0.30000D+04	0.39613D-01	0.22467D+03	0.18719D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11951D+05	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.97538D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.17357D+05	0.56056D+04	0.0	0.13438D+01	0.66759D+01	0.85256D+00	0.25381D+03	0.84839D+00	0.22639D+01
3	SPLITTER	0.11583D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.23793D+05	0.80073D+04	0.0	0.13398D+01	0.36127D+02	0.95606D+00	0.49649D+02	0.87569D+00	0.54399D+01
5	DUCT B	0.91758D-01	0.50000D-01	0.30000D+00	0.28025D-01	0.66156D+02	0.11169D+05	0.31005D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.23793D+05	0.80073D+04	0.10000D+01	0.35033D+01	0.67376D+00	0.50024D+04	0.96971D+00	0.90001D+00	0.23209D+01
7	TURBINE	0.17357D+05	0.56056D+04	0.10000D+01	0.23310D+01	0.55526D+00	0.46686D+04	0.65713D+00	0.89973D+00	0.20366D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10951D+01	0.11028D+01	0.80114D+03	0.51899D+03	0.65148D+03	-0.23222D-06	0.10904D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.27571D-01	0.0	0.26584D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.33656D+05	0.39345D+04	0.64056D+01	0.10945D+04	0.68907D+03	0.98000D+00	0.99402D+00	0.18231D+01	0.64056D+01
11	SHAFT	0.36871D-02	0.80073D+04	0.80073D+04	0.80073D+04	0.0	0.0	0.0	0.15496D-06	0.0
12	SHAFT	-0.25294D-01	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	-0.14573D-05	0.0

MACH= 1.4000   ALTITUDE= 20000.   RECOVERY= 0.9754   0 ITERATIONS   1 PASSES

AIRFLOW (LB/SEC)	264.86	GROSS THRUST	33656.23	FUEL FLOW (LB/HR)	37752.65
NET THRUST	21705.72	TSFC	1.7393	NET THRUST/AIRFLOW	81.9520
TOTAL INLET DRAG	11950.51	TOTAL BRAKE SHAFT HP	-0.02	BOATTAIL DRAG	0.0
INSTALLED THRUST	21705.72	INSTALLED TSFC	1.7393	SPILLAGE + LIP DRAG	0.0

```
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.95992D-01
SUM OF (ERRORS**2)= 0.29509D-01
SUM OF (ERRORS**2)= 0.74871D-03
SUM OF (ERRORS**2)= 0.19775D-04
SUM OF (ERRORS**2)= 0.46661D-06
SUM OF (ERRORS**2)= 0.27486D-02
SUM OF (ERRORS**2)= 0.71142D-04
SUM OF (ERRORS**2)= 0.14289D-05
SUM OF (ERRORS**2)= 0.24928D-07
TM1B3     0
SUM OF (ERRORS**2)= 0.16872D-03
SUM OF (ERRORS**2)= 0.28961D-05
SUM OF (ERRORS**2)= 0.45290D-07
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
TM1B3	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
30000.0 FT	2.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
626.91 LBS/FT**2	4905.20 LBS/FT**2	411.70 DEG R	741.07 DEG R	1755.34 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	9263.844
WFT (LBM/HR)	11291.430
SFC (LBM/HR/LBF)	1.219
W2 COR (LBM/SEC)	172.922
W2 ABS (LBM/SEC)	307.586
RF	0.913
CFG (PRI)	0.979
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.211
AOI/AC	0.789
AOBLD/AC	0.019
AO/AC	0.770
AOBYP/AC	0.0
AOE/AC	0.770

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.045
CD SPL (TAB 3A)	0.035
CD BLD	0.017
CD BYP	0.0
CD INL TOT	0.098
DRAG INL TOT (LBF)	1198.215
CD INL REF	0.035
DRAG INL REF (LBF)	430.059
CD INL PS	0.063
DRAG INL PS (LBF)	768.156

AFTBODY DRAG

A10/A9	2.453
A10 (FT**2)	15.877
A9 (FT**2)	6.472
P9S/PAMB	1.000
CD A/B	0.064
DRAG A/B (LBF)	1772.313
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.064
DRAG A/B TOT (LBF)	1772.313
CD A/B REF	0.032
DRAG A/B REF (LBF)	882.513
CD A/B PS	0.032
DRAG A/B PS (LBF)	889.800

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	7605.8
WFT (LBM/HR)	11291.4
SFC (LBM/HR/LBF)	1.4
FN COR (LBF)	25674.7
WFT COR (LBM/HR)	42782.5
SFC COR (LBM/HR/LBF)	1.6

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	427.
TOTAL (LBM)	=	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	261.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	261.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	671.3
WAVE (LBF)	=	1669.4
TOTAL (LBF)	=	2340.7

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.31066D+03	0.43727D+01	0.41184D+03	0.0	0.92114D+03	0.20000D+01	0.0	0.0
2	0.30752D+03	0.31237D+02	0.74072D+03	0.0	0.17293D+03	0.0	0.0	0.21281D-03
3	0.30752D+03	0.56476D+02	0.89739D+03	0.0	0.10526D+03	0.0	0.0	0.0
4	0.12963D+03	0.55346D+02	0.89739D+03	0.0	0.45273D+02	0.0	0.0	0.22483D-06
5	0.17789D+03	0.55346D+02	0.89739D+03	0.0	0.62131D+02	0.42766D+00	0.48858D+02	0.0
6	0.12315D+03	0.26672D+03	0.14382D+04	0.0	0.11298D+02	0.0	0.0	0.0
7	0.64813D+01	0.23414D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12628D+03	0.23100D+03	0.29304D+04	0.25470D-01	0.19096D+02	0.0	0.0	-0.60559D-07
9	0.13114D+03	0.99906D+02	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	0.27013D-07
10	0.13276D+03	0.52790D+02	0.21186D+04	0.24197D-01	0.74697D+02	0.34536D+00	0.48858D+02	0.0
11	0.31066D+03	0.53536D+02	0.14512D+04	0.10199D-01	0.14264D+03	0.0	0.0	0.0
12	0.31066D+03	0.50324D+02	0.14512D+04	0.10199D-01	0.15174D+03	0.10000D+01	0.26937D+02	0.10773D-06
13	0.31066D+03	0.50324D+02	0.14512D+04	0.10199D-01	0.15174D+03	0.21899D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.19022D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.91321D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16629D+05	0.52731D+04	0.0	0.15427D+01	0.18874D+02	0.73541D+00	0.25381D+03	0.85530D+00	0.18080D+01
3	SPLITTER	0.13724D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25054D+05	0.80318D+04	0.0	0.13775D+01	0.41613D+02	0.91352D+00	0.49649D+02	0.88151D+00	0.48192D+01
5	DUCT B	0.88353D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11291D+05	0.32122D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.25054D+05	0.80318D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23122D+01
7	TURBINE	0.16629D+05	0.52731D+04	0.10000D+01	0.21460D+01	0.55526D+00	0.43867D+04	0.65713D+00	0.90053D+00	0.18925D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74648D+03	0.61463D+03	0.67097D+03	-0.11704D-06	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.28286D+05	0.29295D+04	0.11509D+02	0.93193D+03	0.45627D+03	0.98000D+00	0.97892D+00	0.18682D+01	0.11509D+02
11	SHAFT	0.15911D-02	0.80318D+04	0.80318D+04	0.80318D+04	0.0	0.0	0.0	0.63506D-07	0.0
12	SHAFT	-0.12071D-01	0.52731D+04	0.52731D+04	0.52731D+04	0.0	0.0	0.0	-0.72590D-06	0.0

MACH= 2.0000   ALTITUDE= 30000.   RECOVERY= 0.9132   2 ITERATIONS   3 PASSES

AIRFLOW (LB/SEC)	307.59	GROSS THRUST	28285.55	FUEL FLOW (LB/HR)	11291.43
NET THRUST	9263.84	TSFC	1.2189	NET THRUST/AIRFLOW	30.1179
TOTAL INLET DRAG	19021.70	TOTAL BRAKE SHAFT HP	-0.01	BOATTAIL DRAG	0.0
INSTALLED THRUST	9263.84	INSTALLED TSFC	1.2189	SPILLAGE + LIP DRAG	0.0

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&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
NEP - INPUT
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                                        *** WARNING MESSAGES ***
        MACH 2.000          ALT 30000.
 D/AC EXCEEDS DISTORTION LIMIT.  AD/AC=  0.8052     DISTORTION LIMIT=  0.7918
SUM OF (ERRORS**2)= 0.76586D-02
SUM OF (ERRORS**2)= 0.31361D-03
SUM OF (ERRORS**2)= 0.23772D-04
SUM OF (ERRORS**2)= 0.13809D-04
SUM OF (ERRORS**2)= 0.16618D-03
BROYDEN'S METHOD NOW BEING USED
SUM OF (ERRORS**2)= 0.18850D-05
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INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
TM1B3	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
30000.0 FT	2.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
626.91 LBS/FT**2	4905.20 LBS/FT**2	411.70 DEG R	741.07 DEG R	1755.34 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA
INCORPORATING INLET RECOVERY
AND NOZZLE CFG

FN (LBF)	2117[illegible].867
WFT (LBM/HR)	38420.262
SFC (LBM/HR/LBF)	1.815
W2 COR (LBM/SEC)	197.097
W2 ABS (LBM/SEC)	281.933
RF	0.837
CFG (PRI)	0.978
CGF (SEC)	0.0

INLET MASS
FLOW RATIOS

AOSPL/AC	0.179
AOI/AC	0.821
AOBLD/AC	0.016
AO/AC	0.805
AOBYP/AC	0.0
AOE/AC	0.805

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.021
CD SPL (TAB 3A)	0.035
CD BLD	0.014
CD BYP	0.0
CD INL TOT	0.071
DRAG INL TOT (LBF)	868.283
CD INL REF	0.035
DRAG INL REF (LBF)	430.059
CD INL PS	0.036
DRAG INL PS (LBF)	438.224

AFTBODY DRAG

A10/A9	1.629
A10 (FT**2)	15.877
A9 (FT**2)	9.745
P9S/PAMB	1.000
CD A/B	0.042
DRAG A/B (LBF)	1180.579
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.042
DRAG A/B TOT (LBF)	1180.579
CD A/B REF	0.032
DRAG A/B REF (LBF)	882.513
CD A/B PS	0.011
DRAG A/B PS (LBF)	298.066

INSTALLED ENGINE
PERFORMANCE DATA

FN (LBF)	20437.5
WFT (LBM/HR)	38420.2
SFC (LBM/HR/LBF)	1.8
FN COR (LBF)	68989.9
WFT COR (LBM/HR)	145572.1
SFC COR (LBM/HR/LBF)	2.1

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	427.
TOTAL (LBM)	=	613.

AIR INDUCTION SYSTEM
WEIGHT BREAKDOWN

INLET (LBM)	=	261.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	0.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	261.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	671.3
WAVE (LBF)	=	1669.4
TOTAL (LBF)	=	2340.7

CASE IDENTIFICATION NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.29255D+03	0.43727D+01	0.41184D+03	0.0	0.84432D+03	0.20000D+01	0.0	0.0
2	0.23179D+03	0.28624D+02	0.74072D+03	0.0	0.17298D+03	0.0	0.0	0.49944D-03
3	0.23179D+03	0.51752D+02	0.89739D+03	0.0	0.10525D+03	0.0	0.0	0.0
4	0.11880D+03	0.50717D+02	0.89739D+03	0.0	0.45275D+02	0.0	0.0	-0.84835D-04
5	0.15300D+03	0.50717D+02	0.89739D+03	0.0	0.62127D+02	0.42762D+00	0.44772D+02	0.0
6	0.11286D+03	0.24456D+03	0.14384D+04	0.0	0.11294D+02	0.0	0.0	0.0
7	0.59400D+01	0.21467D+03	0.13859D+04	0.0	0.0	0.0	0.0	0.0
8	0.11581D+03	0.21184D+03	0.29304D+04	0.25467D-01	0.19084D+02	0.0	0.0	-0.62103D-03
9	0.12026D+03	0.91620D+02	0.24308D+04	0.24501D-01	0.41760D+02	0.0	0.0	-0.28147D-04
10	0.12175D+03	0.48411D+02	0.21187D+04	0.24195D-01	0.74697D+02	0.34536D+00	0.44805D+02	0.0
11	0.23475D+03	0.49077D+02	0.14514D+04	0.10203D-01	0.14264D+03	0.0	0.0	0.0
12	0.29255D+03	0.46132D+02	0.30000D+04	0.37868D-01	0.22413D+03	0.10000D+01	0.25295D+02	0.0
13	0.29255D+03	0.46132D+02	0.30000D+04	0.37868D-01	0.22413D+03	0.21356D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.17435D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.83682D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.15238D+05	0.52731D+04	0.0	0.15426D+01	0.18872D+02	0.73541D+00	0.25381D+03	0.85529D+00	0.18080D+01
3	SPLITTER	0.13722D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.22969D+05	0.80324D+04	0.0	0.13770D+01	0.41550D+02	0.91359D+00	0.49649D+02	0.88164D+00	0.48221D+01
5	DUCT B	0.88220D-01	0.50000D-01	0.30000D+00	0.26808D-01	0.66156D+02	0.10347D+05	0.32107D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.22976D+05	0.80324D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50155D+04	0.96971D+00	0.90010D+00	0.23122D+01
7	TURBINE	0.15250D+05	0.52731D+04	0.10000D+01	0.21461D+01	0.55526D+00	0.43867D+04	0.65713D+00	0.90053D+00	0.18926D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74649D+03	0.61457D+03	0.67097D+03	-0.73496D-03	0.10957D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.27385D-01	0.0	0.28073D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.38609D+05	0.42461D+04	0.10550D+02	0.14033D+04	0.68721D+03	0.98000D+00	0.97797D+00	0.18238D+01	0.10550D+02
11	SHAFT	0.65072D+01	0.80324D+04	0.80324D+04	0.80324D+04	0.0	0.0	0.0	0.28326D-03	0.0
12	SHAFT	0.12018D+02	0.52731D+04	0.52731D+04	0.52731D+04	0.0	0.0	0.0	0.78835D-03	0.0

MACH= 2.0000 ALTITUDE= 30000. RECOVERY= 0.8368 5 ITERATIONS 6 PASSES

AIRFLOW (LB/SEC)	281.93	GROSS THRUST	38609.14	FUEL FLOW (LB/HR)	38420.26
NET THRUST	21173.87	TSFC	1.8145	NET THRUST/AIRFLOW	75.1024
TOTAL INLET DRAG	17435.27	TOTAL BRAKE SHAFT HP	18.52	BOATTAIL DRAG	0.0
INSTALLED THRUST	21173.87	INSTALLED TSFC	1.8145	SPILLAGE + LIP DRAG	0.0

```
&D
ENDIT=1,
&END
NEP - INPUT
```

8.2.3 DATABASE INLET 'FB', DATABASE NOZZLE 'ADENAB'

```
&D
IWT=0,INST=1,IFLGRF=0,AJMAX=0.,AJMIN=0.,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.33382D+00
SUM OF (ERRORS**2)= 0.17460D+00
SUM OF (ERRORS**2)= 0.70074D-01
SUM OF (ERRORS**2)= 0.12444D-01
SUM OF (ERRORS**2)= 0.72217D-03
SUM OF (ERRORS**2)= 0.32871D-03
SUM OF (ERRORS**2)= 0.30478D-04
SUM OF (ERRORS**2)= 0.10161D-04
SUM OF (ERRORS**2)= 0.24682D-05
SUM OF (ERRORS**2)= 0.58038D-06
&I
INMAP='FB',NOZMAP='ADENAB',CFGMAP='ADENCFG',DCDMAP=0,
DERP=0,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.000105,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
INSTAL - INSTLL
 1
SUM OF (ERRORS**2)= 0.58038D-06
```

```
&D
SPEC(5,10)=5556,
&END
NEP - INPUT

MODE    1 NOW BEING USED
```

OLD INSTALLATION MAPS

****
* TABLE 1 *
****

LOCAL MACH NUMBER (MNO) VS FREE STREAM MACH NUMBER (MNFS)

0.0	1.000	2.000	3.000	MNO
0.0	1.000	2.000	3.000	MNFS

****
* TABLE 2A *
****

INLET PRESSURE RECOVERY (PT2/PT0) VS MASS FLOW RATIO (AO/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.600	0.750	0.775	0.800	0.825	0.850	0.875	0.900	AO/AC	
	0.990	0.990	0.985	0.982	0.973	0.958	0.928	PT2/PT0	
MNO=0.850	0.625	0.650	0.675	0.700	0.725	0.750	0.775	0.780	AO/AC
	0.985	0.985	0.983	0.980	0.975	0.962	0.925	0.900	PT2/PT0
MNO=1.200	0.625	0.650	0.675	0.700	0.725	0.750	0.765	0.775	AO/AC
	0.980	0.980	0.976	0.972	0.965	0.947	0.920	0.850	PT2/PT0
MNO=2.000	0.700	0.725	0.750	0.775	0.800	0.820	0.830	0.840	AO/AC
	0.942	0.939	0.935	0.930	0.923	0.913	0.895	0.825	PT2/PT0
MNO=2.001	0.700	0.725	0.750	0.775	0.800	0.820	0.835	0.845	AO/AC
	0.958	0.956	0.954	0.950	0.945	0.933	0.908	0.850	PT2/PT0
MNO=2.500	0.800	0.825	0.850	0.875	0.900	0.915	0.925	0.930	AO/AC
	0.933	0.930	0.925	0.920	0.912	0.900	0.880	0.850	PT2/PT0

****
* TABLE 2B *
****

OPTIMUM INLET RECOVERY (PT2/PT0 OPT) VS LOCAL MACH NUMBER (MNO)

0.0	0.300	0.600	1.000	1.400	1.700	2.000	2.001	2.200	2.500	MNO
0.920	0.969	0.980	0.979	0.970	0.955	0.929	0.940	0.925	0.900	PT2/PT0

****
* TABLE 2C *

OPTIMUM MASS FLOW RATIO (AO/AC OPT) VS LOCAL MACH NUMBER (MNO)

```
************

            0.600    0.800    1.000    1.200    1.400    1.600    2.000    2.001    2.200    2.500    MNO
            0.833    0.728    0.688    0.683    0.694    0.716    0.787    0.812    0.856    0.916    AO/AC

************
* TABLE 2D *        BUZZ LIMIT MASS FLOW RATIO (AO/AC)        VS        LOCAL MACH NUMBER (MNO)
************

            0.0      1.400    1.500    1.600    1.800    2.000    2.001    2.200    2.500    MNO
            0.0      0.0      0.490    0.545    0.610    0.650    0.775    0.822    0.875    AO/AC

************
* TABLE 2E *        DISTORTION LIMIT MASS FLOW RATIO (AO/AC)    VS        LOCAL MACH NUMBER (MNO)
************

            0.600    0.800    1.000    1.200    1.400    1.600    2.000    2.001    2.200    2.500    MNO
            0.885    0.765    0.740    0.745    0.755    0.775    0.830    0.838    0.880    0.928    AO/AC

************
* TABLE 3  * SPILLAGE DRAG COEFFICIENT (CDSPL)        VS        INLET MASS FLOW RATIO (AOI/AC)    AND    LOCAL MACH NUMBER (MNO)
************

MNO=0.600   0.400    0.500    0.600    0.700    0.765    1.000    AOI/AC
            0.143    0.100    0.060    0.022    0.0      0.0      CDSPL

MNO=0.900   0.400    0.500    0.600    0.700    0.765    1.000    AOI/AC
            0.243    0.167    0.095    0.033    0.0      0.0      CDSPL

MNO=1.200   0.400    0.500    0.600    0.700    0.765    0.775    1.000    AOI/AC
            0.310    0.225    0.140    0.058    0.008    0.0      0.0      CDSPL

MNO=1.500   0.400    0.500    0.600    0.700    0.765    0.775    0.800    1.000    AOI/AC
            0.410    0.302    0.195    0.095    0.033    0.023    0.0      0.0      CDSPL

MNO=1.700   0.400    0.500    0.600    0.700    0.765    0.775    0.800    0.823    1.000    AOI/AC
            0.440    0.440    0.393    0.155    0.070    0.060    0.028    0.0      0.0      CDSPL

MNO=1.990   0.400    0.500    0.600    0.700    0.765    0.775    0.800    0.823    0.865    1.000    AOI/AC
            0.400    0.400    0.400    0.250    0.150    0.136    0.097    0.060    0.0      0.0      CDSPL

MNO=2.000   0.400    0.700    1.000    AOI/AC
            0.023    0.023    0.023    CDSPL

MNO=2.200   0.400    0.700    1.000    AOI/AC
```

```
               0.013     0.013     0.013     CDSPL

MNO=2.400      0.400     0.700     1.000     AOI/AC
               0.005     0.005     0.005     CDSPL

MNO=2.500      0.400     0.700     1.000     AOI/AC
               0.002     0.002     0.002     CDSPL


************
* TABLE 3A *          REF SPILLAGE DRAG COEFF (REF CDSPL)        VS        LOCAL MACH NUMBER (MNO)
************

               0.0       0.700     0.800     1.200     1.600     2.000     2.010     2.500     MNO
               0.0       0.0       0.030     0.050     0.050     0.045     0.025     0.010     REF CDSPL

************
* TABLE 3B *          REF INLET MASS FLOW RATIO (REF AOI/AC)     VS        LOCAL MACH NUMBER (MNO)
************

               0.0       0.400     0.800     1.200     1.600     2.000     2.010     2.500     MNO
               0.770     0.770     0.770     0.778     0.810     0.865     0.880     0.985     REF AOI/AC

************
* TABLE 4  *     BLEED DRAG COEFFICIENT (CD BLD)      VS     BLEED MASS FLOW RATIO (AOBLD/AC)      AND      LOCAL MACH NUMBER (MNO)
************

               9.600     0.790     0.800     1.200     1.600     2.000     2.001     2.500     MNO

MNO=0.600      0.0       0.105     AOBLD/AC
               0.0       0.0       CDBLD

MNO=0.790      0.0       0.105     AOBLD/AC
               0.0       0.0       CDBLD

MNO=0.800      0.0       0.105     AOBLD/AC
               0.0       0.067     CDBLD

MNO=1.200      0.0       0.105     AOBLD/AC
               0.0       0.055     CDBLD

MNO=1.600      0.0       0.105     AOBLD/AC
               0.0       0.361     CDBLD

MNO=2.000      0.0       0.105     AOBLD/AC
```

	0.0	0.067	CDBLD
MNO=2.001	0.0	0.105	AOBLD/AC
	0.0	0.075	CDBLD
MNO=2.500	0.0	0.105	AOBLD/AC
	0.0	0.060	CDBLD

****
* TABLE 5 *
****

BYPASS DRAG COEFFICIENT (CDBYP) VS BYPASS MASS FLOW RATIO (AOBYP/AC) AND LOCAL MACH NUMBER (MNO)

	0.0	1.200	1.201	1.700	2.200	2.500	MNO				
MNO=0.0	0.0	0.040	0.060	0.080	0.100	0.120	0.140	0.180	0.220	0.260	AOBYP/AC
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CDBYP
MNO=1.200	0.0	0.040	0.060	0.080	0.100	0.120	0.140	0.180	0.220	0.260	AOBYP/AC
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CDBYP
MNO=1.201	0.0	0.040	0.060	0.080	0.100	0.120	0.140	0.180	0.220	0.260	AOBYP/AC
	0.0	0.040	0.070	0.112	0.163	0.235	0.330	0.330	0.330	0.330	CDBYP
MNO=1.700	0.0	0.040	0.060	0.080	0.100	0.120	0.140	0.180	0.220	0.260	ACBYP/AC
	0.0	0.030	0.053	0.085	0.135	0.200	0.290	0.290	0.290	0.290	CDBYP
MNO=2.200	0.0	0.040	0.060	0.080	0.100	0.120	0.140	0.180	0.220	0.260	AOBYP/AC
	0.0	0.025	0.037	0.050	0.063	0.080	0.095	0.135	0.185	0.257	CDBYP
MNO=2.500	0.0	0.040	0.060	0.080	0.100	0.120	0.140	0.180	0.220	0.260	AOBYP/AC
	0.0	0.020	0.028	0.040	0.050	0.063	0.075	0.108	0.150	0.215	CDBYP

****
* TABLE 6A *
****

BLEED MASS FLOW RATIO (AOBLD/AC) VS MASS FLOW RATIO (AO/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.0	0.500	0.600	0.700	0.800	0.850	0.875	AO/AC
	0.0	0.0	0.0	0.0	0.0	0.0	AOBLD/AC
MNO=0.799	0.500	0.600	0.700	0.800	0.850	0.875	AO/AC
	0.0	0.0	0.0	0.0	0.0	0.0	AOBLD/AC

MNO=0.800	0.500	0.600	0.700	0.800	AO/AC		
	0.030	0.019	0.005	0.0	AOBLD/AC		
MNO=1.200	0.500	0.600	0.700	0.800	AO/AC		
	0.049	0.038	0.021	0.0	AOBLD/AC		
MNO=1.700	0.500	0.600	0.700	0.800	0.850	AO/AC	
	0.104	0.083	0.058	0.025	0.0	AOBLD/AC	
MNO=2.000	0.500	0.600	0.700	0.800	0.850	0.875	AO/AC
	0.110	0.110	0.110	0.051	0.021	0.007	AOBLD/AC

****
* TABLE 6B *
****

OPTIMUM BLEED MASS FLOW RATIO (AOBLD/AC) VS LOCAL MACH NUMBER (MNO)

2.001	2.500	MNO
0.060	0.070	AOBLD/AC

****
* TABLE 7 *
****

BYPASS MASS FLOW RATIO (AOBYP/AC) VS ENGINE MASS FLOW RATIO (AOE/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.0	0.400	0.685	0.715	0.785	0.815	0.855	0.915	AOE/AC
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	AOBYP/AC
MNO=1.190	0.400	0.685	0.715	0.785	0.815	0.855	0.915	AOE/AC
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	AOBYP/AC
MNO=1.200	0.400	0.685	AOE/AC					
	0.285	0.0	AOBYP/AC					
MNO=1.600	0.400	0.685	0.715	AOE/AC				
	0.315	0.003	0.0	AOBYP/AC				
MNO=2.000	0.400	0.685	0.715	0.785	AOE/AC			
	0.388	0.100	0.068	0.0	AOBYP/AC			
MNO=2.001	0.400	0.685	0.715	0.785	0.815	AOE/AC		
	0.413	0.128	0.098	0.030	0.0	AOBYP/AC		

MNO=2.200	0.400	0.685	0.715	0.785	0.815	0.855	AOE/AC	
	0.457	0.170	0.140	0.070	0.040	0.0	AOBYP/AC	
MNO=2.500	0.400	0.685	0.715	0.785	0.815	0.855	0.915	AOE/AC
	0.517	0.230	0.200	0.130	0.100	0.060	0.0	AOBYP/AC

INLET START MACH NUMBER 2.010

MINIMUM MACH NUMBER FOR INLET DRAG CALCULATIONS 0.600

```
************
* TABLE AB *   AFT-BODY DRAG COEFFICIENT (CD A/B)     VS      FREE STREAM MACH NUMBER (MNFS)        AND AFT-BODY AREA RATIO (A10/A9)
************

               2.273     2.500     3.330     5.000     A10/A9

A10/A9= 2.273  0.600     0.800     0.900     0.950     1.000     1.100     1.200     1.500     2.000     2.200     MNFS
               0.036     0.036     0.043     0.071     0.264     0.204     0.188     0.121     0.107     0.102     CD A/B

A10/A9= 2.500  0.600     0.800     0.900     0.950     1.000     1.100     1.200     1.500     2.000     2.200     MNFS
               0.035     0.035     0.043     0.068     0.258     0.203     0.188     0.128     0.113     0.108     CD A/B

A10/A9= 3.330  0.600     0.800     0.900     0.950     1.000     1.100     1.200     1.500     2.000     2.200     MNFS
               0.037     0.037     0.046     0.081     0.273     0.219     0.206     0.151     0.147     0.143     CD A/B

A10/A9= 5.000  0.600     0.800     0.900     0.950     1.000     1.100     1.200     1.500     2.000     2.200     MNFS
               0.040     0.040     0.050     0.096     0.279     0.239     0.226     0.180     0.173     0.169     CD A/B
```

```
************
* TABLE CFG*        GROSS THRUST COEFFICIENT (CFG)      VS     NOZZLE PRESSURE RATIO (PT9/PAMB)     AND   POWER SETTING (PS)
************

               1.000     1.500     2.000     PS

PS      1.000 2.000     4.000     6.000     8.000    10.000    12.000    PT9/PAMB
              0.945     0.970     0.988     0.990     0.985     0.984    CFG

PS      1.500 2.000     4.000     6.000     8.000    10.000    12.000    PT9/PAMB
              0.925     0.985     0.990     0.985     0.983     0.980    CFG

PS      2.000 2.000     4.000     6.000     8.000    10.000    12.000    PT9/PAMB
              0.950     0.978     0.983     0.982     0.979     0.976    CFG
```

C-5

Z = 0.0	A9A8=	0.10000D+01						
	PTPO	0.20000D+01	0.40000D+01	0.60000D+01	0.80000D+01	0.10000D+02	0.12000D+02
	CV	0.94500D+00	0.97000D+00	0.98750D+00	0.99000D+00	0.98500D+00	0.98400D+00
Z = 0.0	A9A8=	0.15000D+01						
	PTPO	0.20000D+01	0.40000D+01	0.60000D+01	0.80000D+01	0.10000D+02	0.12000D+02
	CV	0.92500D+00	0.98500D+00	0.99000D+00	0.98500D+00	0.98250D+00	0.98000D+00
Z = 0.0	A9A8=	0.20000D+01						
	PTPO	0.20000D+01	0.40000D+01	0.60000D+01	0.80000D+01	0.10000D+02	0.12000D+02
	CV	0.95000D+00	0.97750D+00	0.98250D+00	0.98200D+00	0.97900D+00	0.97600D+00

TABLE DATA INPUT SUMMARY 11 TABLES

TABLE NUMBER	REFERENCE NUMBER	ARRAY LOCATION
1	1001	1
2	1002	1075
3	1003	2149
4	1004	3223
5	1005	4459
6	1006	5695
7	1007	6931
8	1008	7384
9	1009	7978
10	1010	8431
11	5556	9172

```
DATA STORAGE ALLOCATION 20000
DATA STORAGE NOT USED   10747
```

```
SUM OF (ERRORS**2)= 0.58038D-06
FB       0
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
ETTED AREA - NACWET
&INLWT
SLST=16200.,INLET=1,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=1.,TDOOR=0.,
&END
NLET WEIGHT - INLWT
SUM OF (ERRORS**2)= 0.43946D-03
SUM OF (ERRORS**2)= 0.55500D-07
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
FB	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
10000.0 FT	0.60

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1454.24 LBS/FT**2	1854.89 LBS/FT**2	483.03 DEG R	517.81 DEG R	366.47 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	10718.484
WFT (LBM/HR)	10196.762
SFC (LBM/HR/LBF)	0.951
W2 COR (LBM/SEC)	250.614
W2 ABS (LBM/SEC)	215.499
RF	0.980
CFG (PRI)	0.964
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.167
AOI/AC	0.833
AOBLD/AC	0.0
AO/AC	0.833
AOBYP/AC	0.0
AOE/AC	0.844

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.0
CD SPL (TAB 3A)	0.0
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.0
DRAG INL TOT (LBF)	0.0
CD INL REF	0.0
DRAG INL REF (LBF)	0.0
CD INL PS	0.0
DRAG INL PS (LBF)	0.0

AFTBODY DRAG

A10/A9	4.438
A10 (FT**2)	15.877
A9 (FT**2)	3.577
P9S/PAMB	1.000
CD A/B	0.030
DRAG A/B (LBF)	175.747
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.030
DRAG A/B TOT (LBF)	175.747
CD A/B REF	0.031
DRAG A/B REF (LBF)	179.600
CD A/B PS	-0.001
DRAG A/B PS (LBF)	-3.853

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	10722.3
WFT (LBM/HR)	10196.76
SFC (LBM/HR/LBF)	0.95
FN COR (LBF)	15603.20
WFT COR (LBM/HR)	15376.39
SFC COR (LBM/HR/LBF)	0.98

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	360.
TOTAL (LBM)	=	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	1083.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	156.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	1239.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	191.3
FORM (LBF)	=	13.5
TOTAL (LBF)	=	204.8

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.21838D+03	0.10108D+02	0.48303D+03	0.0	0.30234D+03	0.60000D+00	0.0	0.0
2	0.21555D+03	0.12639D+02	0.51785D+03	0.0	0.25036D+03	0.0	0.0	-0.23558D-03
3	0.21555D+03	0.38006D+02	0.74239D+03	0.0	0.99714D+02	0.0	0.0	0.0
4	0.10783D+03	0.37246D+02	0.74239D+03	0.0	0.50899D+02	0.0	0.0	0.26906D-07
5	0.10772D+03	0.37246D+02	0.74239D+03	0.0	0.50849D+02	0.33530D+00	0.34464D+02	0.0
6	0.10244D+03	0.22363D+03	0.12941D+04	0.0	0.10633D+02	0.0	0.0	0.0
7	0.53914D+01	0.19356D+03	0.12405D+04	0.0	0.0	0.0	0.0	0.0
8	0.10527D+03	0.19231D+03	0.29249D+04	0.27651D-01	0.19103D+02	0.0	0.0	0.23863D-08
9	0.10931D+03	0.82928D+02	0.24225D+04	0.26601D-01	0.41864D+02	0.0	0.0	0.16533D-07
10	0.11066D+03	0.38230D+02	0.20522D+04	0.26268D-01	0.84614D+02	0.40016D+00	0.34464D+02	0.0
11	0.21838D+03	0.37550D+02	0.14436D+04	0.13140D-01	0.14258D+03	0.0	0.0	0.0
12	0.21838D+03	0.35297D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.10000D+01	0.18904D+02	0.37504D-07
13	0.21838D+03	0.35297D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.14186D+01	0.10108D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.43298D+04	0.64644D+03	0.38298D+03	0.10721D+01	0.12759D+01	0.60000D+00	0.98000D+00	0.99842D+00	0.10000D+05
2	COMPRESR	-0.16491D+05	0.60050D+04	0.0	0.15047D+01	0.54534D+01	0.10016D+01	0.25381D+03	0.84986D+00	0.30069D+01
3	SPLITTER	0.99902D+00	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.20890D+05	0.79990D+04	0.0	0.12996D+01	0.28061D+02	0.10003D+01	0.49649D+02	0.85982D+00	0.60041D+01
5	DUCT B	0.94802D-01	0.50000D-01	0.30000D+00	0.29106D-01	0.66156D+02	0.10197D+05	0.29991D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.20891D+05	0.79990D+04	0.10000D+01	0.34998D+01	0.67376D+00	0.49994D+04	0.96971D+00	0.90000D+00	0.23190D+01
7	TURBINE	0.16491D+05	0.60050D+04	0.10000D+01	0.25013D+01	0.55526D+00	0.50042D+04	0.65713D+00	0.90000D+00	0.21692D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11093D+01	0.10807D+01	0.84902D+03	0.44216D+03	0.64832D+03	-0.33224D-07	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.15048D+05	0.22170D+04	0.34919D+01	0.51511D+03	0.45627D+03	0.98000D+00	0.96418D+00	0.18672D+01	0.34919D+01
11	SHAFT	0.11925D-02	0.79990D+04	0.79990D+04	0.79990D+04	0.0	0.0	0.0	0.57085D-07	0.0
12	SHAFT	0.10821D-02	0.60050D+04	0.60050D+04	0.60050D+04	0.0	0.0	0.0	0.65618D-07	0.0

MACH= 0.6000   ALTITUDE= 10000.   RECOVERY= 0.9800   1 ITERATIONS   10 PASSES

AIRFLOW (LB/SEC)	215.50	GROSS THRUST	15048.31	FUEL FLOW (LB/HR)	10196.76
NET THRUST	10718.49	TSFC	0.9513	NET THRUST/AIRFLOW	49.7379
TOTAL INLET DRAG	4329.83	TOTAL BRAKE SHAFT HP	0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	10718.49	INSTALLED TSFC	0.9513	SPILLAGE + LIP DRAG	0.0

```
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.19173D-01
SUM OF (ERRORS**2)= 0.43951D-04
SUM OF (ERRORS**2)= 0.12548D-05
SUM OF (ERRORS**2)= 0.43634D-03
SUM OF (ERRORS**2)= 0.25204D-05
SUM OF (ERRORS**2)= 0.16937D-07
FB       0
SUM OF (ERRORS**2)= 0.30598D-03
SUM OF (ERRORS**2)= 0.18736D-05
SUM OF (ERRORS**2)= 0.92361D-08
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
FB	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
15000.0 FT	1.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1192.90 LBS/FT**2	2258.08 LBS/FT**2	465.20 DEG R	558.24 DEG R	835.03 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	10191.926
WFT (LBM/HR)	10547.277
SFC (LBM/HR/LBF)	1.035
W2 COR (LBM/SEC)	229.572
W2 ABS (LBM/SEC)	232.604
RF	0.983
CFG (PRI)	0.976
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.328
AOI/AC	0.672
AOBLD/AC	0.020
AO/AC	0.652
AOBYP/AC	0.0
AOE/AC	0.652

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.061
CD SPL (TAB 3A)	0.040
CD BLD	0.012
CD BYP	0.0
CD INL TOT	0.112
DRAG INL TOT (LBF)	655.562
CD INL REF	0.040
DRAG INL REF (LBF)	233.808
CD INL PS	0.072
DRAG INL PS (LBF)	421.753

AFTBODY DRAG

A10/A9	3.941
A10 (FT**2)	15.877
A9 (FT**2)	4.028
P9S/PAMB	1.000
CD A/B	0.205
DRAG A/B (LBF)	2722.742
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.205
DRAG A/B TOT (LBF)	2722.742
CD A/B REF	0.214
DRAG A/B REF (LBF)	2840.254
CD A/B PS	-0.009
DRAG A/B PS (LBF)	-117.512

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	9887.68
WFT (LBM/HR)	10547.27
SFC (LBM/HR/LBF)	1.06
FN COR (LBF)	17540.86
WFT COR (LBM/HR)	19757.51
SFC COR (LBM/HR/LBF)	1.12

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	49.
FIREWALL (LBM) =	138.
COWL (LBM) =	360.
TOTAL (LBM) =	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	1083.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	156.
T/O DOORS (LBM) =	0.
TOTAL (LBM) =	1239.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	391.2
FORM (LBF) =	27.6
TOTAL (LBF) =	418.7

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	3210.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	3210.

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.23551D+03	0.82972D+01	0.46522D+03	0.0	0.39018D+03	0.10000D+01	0.0	0.0
2	0.23258D+03	0.15445D+02	0.55835D+03	0.0	0.22962D+03	0.0	0.0	0.96105D-04
3	0.23258D+03	0.41290D+02	0.77032D+03	0.0	0.10088D+03	0.0	0.0	0.0
4	0.11321D+03	0.40464D+02	0.77032D+03	0.0	0.50108D+02	0.0	0.0	-0.13100D-07
5	0.11937D+03	0.40464D+02	0.77032D+03	0.0	0.52832D+02	0.35068D+00	0.37173D+02	0.0
6	0.10755D+03	0.23447D+03	0.13214D+04	0.0	0.10759D+02	0.0	0.0	0.0
7	0.56606D+01	0.20340D+03	0.12679D+04	0.0	0.0	0.0	0.0	0.0
8	0.11048D+03	0.20191D+03	0.29259D+04	0.27241D-01	0.19099D+02	0.0	0.0	-0.13689D-08
9	0.11473D+03	0.86930D+02	0.24229D+04	0.26206D-01	0.41919D+02	0.0	0.0	-0.14865D-08
10	0.11614D+03	0.41036D+02	0.20628D+04	0.25879D-01	0.82946D+02	0.39064D+00	0.37173D+02	0.0
11	0.23551D+03	0.40501D+02	0.14442D+04	0.12597D-01	0.14260D+03	0.0	0.0	0.0
12	0.23551D+03	0.38071D+02	0.14442D+04	0.12597D-01	0.15170D+03	0.10000D+01	0.20387D+02	-0.10868D-07
13	0.23551D+03	0.38071D+02	0.14442D+04	0.12597D-01	0.15170D+03	0.16148D+01	0.82972D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.76442D+04	0.10574D+04	0.62642D+03	0.12002D+01	0.18946D+01	0.10000D+01	0.98253D+00	0.10765D+01	0.15000D+05
2	COMPRESR	-0.16827D+05	0.57981D+04	0.0	0.13813D+01	0.42210D+01	0.93138D+00	0.25381D+03	0.85079D+00	0.26733D+01
3	SPLITTER	0.10544D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.21977D+05	0.80245D+04	0.0	0.13177D+01	0.31445D+02	0.98509D+00	0.49649D+02	0.86757D+00	0.57945D+01
5	DUCT B	0.93537D-01	0.50000D-01	0.30000D+00	0.28674D-01	0.66156D+02	0.10547D+05	0.30392D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.21977D+05	0.80245D+04	0.10000D+01	0.35068D+01	0.67376D+00	0.50144D+04	0.96971D+00	0.90009D+00	0.23227D+01
7	TURBINE	0.16827D+05	0.57981D+04	0.10000D+01	0.24360D+01	0.55526D+00	0.48313D+04	0.65713D+00	0.89994D+00	0.21184D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11039D+01	0.10885D+01	0.83137D+03	0.47042D+03	0.64842D+03	0.15361D-07	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.17836D+05	0.24367D+04	0.45884D+01	0.58006D+03	0.45627D+03	0.98000D+00	0.97634D+00	0.18674D+01	0.45884D+01
11	SHAFT	-0.24103D-04	0.80245D+04	0.80245D+04	0.80245D+04	0.0	0.0	0.0	-0.10967D-08	0.0
12	SHAFT	-0.22843D-03	0.57981D+04	0.57981D+04	0.57981D+04	0.0	0.0	0.0	-0.13575D-07	0.0

MACH= 1.0000   ALTITUDE= 15000.   RECOVERY= 0.9825   2 ITERATIONS   3 PASSES

AIRFLOW (LB/SEC)	232.60	GROSS THRUST	17836.15	FUEL FLOW (LB/HR)	10547.28
NET THRUST	10191.93	TSFC	1.0349	NET THRUST/AIRFLOW	43.8166
TOTAL INLET DRAG	7644.22	TOTAL BRAKE SHAFT HP	-0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	10191.93	INSTALLED TSFC	1.0349	SPILLAGE + LIP DRAG	0.0

```
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.42143D-01
SUM OF (ERRORS**2)= 0.34309D-02
SUM OF (ERRORS**2)= 0.14422D-04
SUM OF (ERRORS**2)= 0.41459D-06
SUM OF (ERRORS**2)= 0.14137D-04
SUM OF (ERRORS**2)= 0.20505D-06
FB       0
SUM OF (ERRORS**2)= 0.15574D-03
SUM OF (ERRORS**2)= 0.19240D-05
SUM OF (ERRORS**2)= 0.21541D-07
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
FB	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
20000.0 FT	1.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
970.98 LBS/FT**2	3089.92 LBS/FT**2	447.37 DEG R	622.73 DEG R	1332.18 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	10140.785
WFT (LBM/HR)	11067.359
SFC (LBM/HR/LBF)	1.091
W2 COR (LBM/SEC)	203.139
W2 ABS (LBM/SEC)	262.368
RF	0.967
CFG (PRI)	0.989
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.273
AOI/AC	0.727
AOBLD/AC	0.038
AO/AC	0.689
AOBYP/AC	0.056
AOE/AC	0.633

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.059
CD SPL (TAB 3A)	0.050
CD BLD	0.021
CD BYP	0.058
CD INL TOT	0.188
DRAG INL TOT (LBF)	1749.405
CD INL REF	0.050
DRAG INL REF (LBF)	466.263
CD INL PS	0.138
DRAG INL PS (LBF)	1283.141

AFTBODY DRAG

A10/A9	3.325
A10 (FT**2)	15.877
A9 (FT**2)	4.776
P9S/PAMB	1.000
CD A/B	0.118
DRAG A/B (LBF)	2502.123
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.118
DRAG A/B TOT (LBF)	2502.123
CD A/B REF	0.088
DRAG A/B REF (LBF)	1861.454
CD A/B PS	0.030
DRAG A/B PS (LBF)	640.668

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	8216.96
WFT (LBM/HR)	11067.35
SFC (LBM/HR/LBF)	1.34
FN COR (LBF)	17908.60
WFT COR (LBM/HR)	25972.66
SFC COR (LBM/HR/LBF)	1.45

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	360.
TOTAL (LBM)	=	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	1083.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	156.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	1239.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	564.8
WAVE (LBF)	=	1446.5
TOTAL (LBF)	=	2011.3

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.26540D+03	0.67589D+01	0.44741D+03	0.0	0.52983D+03	0.14000D+01	0.0	0.0
2	0.26233D+03	0.20806D+02	0.62285D+03	0.0	0.20308D+03	0.0	0.0	0.14677D-03
3	0.26233D+03	0.47102D+02	0.81430D+03	0.0	0.10255D+03	0.0	0.0	0.0
4	0.12155D+03	0.46159D+02	0.81430D+03	0.0	0.48487D+02	0.0	0.0	-0.92871D-09
5	0.14078D+03	0.46159D+02	0.81430D+03	0.0	0.56160D+02	0.37720D+00	0.41856D+02	0.0
6	0.11547D+03	0.25110D+03	0.13622D+04	0.0	0.10952D+02	0.0	0.0	0.0
7	0.60773D+01	0.21871D+03	0.13091D+04	0.0	0.0	0.0	0.0	0.0
8	0.11854D+03	0.21666D+03	0.29275D+04	0.26624D-01	0.19103D+02	0.0	0.0	0.15600D-07
9	0.12310D+03	0.93354D+02	0.24253D+04	0.25613D-01	0.41904D+02	0.0	0.0	-0.16412D-07
10	0.12462D+03	0.45839D+02	0.20819D+04	0.25293D-01	0.80046D+02	0.37440D+00	0.41856D+02	0.0
11	0.26540D+03	0.45640D+02	0.14445D+04	0.11719D-01	0.14262D+03	0.0	0.0	0.0
12	0.26540D+03	0.42902D+02	0.14445D+04	0.11719D-01	0.15172D+03	0.10000D+01	0.22969D+02	0.16595D-07
13	0.26540D+03	0.42902D+02	0.14445D+04	0.11719D-01	0.15172D+03	0.18427D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11838D+05	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.96654D+00	0.12099D+01	0.20000D+05
2	COMPRESR	-0.17200D+05	0.56056D+04	0.0	0.13438D+01	0.66759D+01	0.85256D+00	0.25381D+03	0.84839D+00	0.22639D+01
3	SPLITTER	0.11583D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.23577D+05	0.80073D+04	0.0	0.13398D+01	0.36127D+02	0.95606D+00	0.49649D+02	0.87569D+00	0.54399D+01
5	DUCT B	0.91758D-01	0.50000D-01	0.30000D+00	0.28025D-01	0.66156D+02	0.11067D+05	0.31005D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.23577D+05	0.80073D+04	0.10000D+01	0.35033D+01	0.67376D+00	0.50024D+04	0.96971D+00	0.90001D+00	0.23209D+01
7	TURBINE	0.17200D+05	0.56056D+04	0.10000D+01	0.23310D+01	0.55526D+00	0.46686D+04	0.65713D+00	0.89973D+00	0.20366D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10951D+01	0.11028D+01	0.80114D+03	0.51899D+03	0.65148D+03	0.16251D-07	0.10904D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.21979D+05	0.26644D+04	0.63475D+01	0.68769D+03	0.45627D+03	0.98000D+00	0.98897D+00	0.18678D+01	0.63475D+01
11	SHAFT	-0.27620D-03	0.80073D+04	0.80073D+04	0.80073D+04	0.0	0.0	0.0	-0.11715D-07	0.0
12	SHAFT	0.32280D-02	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	0.18768D-06	0.0

MACH= 1.4000   ALTITUDE= 20000.   RECOVERY= 0.9665   2 ITERATIONS   3 PASSES

AIRFLOW (LB/SEC)	262.37	GROSS THRUST	21978.92	FUEL FLOW (LB/HR)	11067.36
NET THRUST	10140.79	TSFC	1.0914	NET THRUST/AIRFLOW	38.6510
TOTAL INLET DRAG	11838.13	TOTAL BRAKE SHAFT HP	0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	10140.79	INSTALLED TSFC	1.0914	SPILLAGE + LIP DRAG	0.0

```
&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
NFP - INPUT
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
FB	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
20000.0 FT	1.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
970.98 LBS/FT**2	3089.92 LBS/FT**2	447.37 DEG R	622.73 DEG R	1332.18 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA
INCORPORATING INLET RECOVERY
AND NOZZLE CFG

FN (LBF)	74218.000
WFT (LBM/HR)	47063.133
SFC (LBM/HR/LBF)	0.634
W2 COR (LBM/SEC)	152.555
W2 ABS (LBM/SEC)	203.670
RF	0.965
CFG (PRI)	0.973
CGF (SEC)	0.0

INLET MASS
FLOW RATIOS

AOSPL/AC	0.267
AOI/AC	0.733
AOBLD/AC	0.036
AO/AC	0.696
AOBYP/AC	0.222
AOE/AC	0.475

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.053
CD SPL (TAB 3A)	0.050
CD BLD	0.020
CD BYP	0.314
CD INL TOT	0.438
DRAG INL TOT (LBF)	4080.372
CD INL REF	0.050
DRAG INL REF (LBF)	466.263
CD INL PS	0.388
DRAG INL PS (LBF)	3614.108

AFTBODY DRAG

A10/A9	1.431
A10 (FT**2)	15.877
A9 (FT**2)	11.095
P95/PAMB	1.000
CD A/B	0.038
DRAG A/B (LBF)	805.750
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.038
DRAG A/B TOT (LBF)	805.750
CD A/B REF	0.038
DRAG A/B REF (LBF)	801.783
CD A/B PS	0.000
DRAG A/B PS (LBF)	3.967

INSTALLED ENGINE
PERFORMANCE DATA

FN (LBF)	70599.87
WFT (LBM/HR)	47063.13
SFC (LBM/HR/LBF)	0.66
FN COR (LBF)	153870.06
WFT COR (LBM/HR)	110446.81
SFC COR (LBM/HR/LBF)	0.71

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	360.
TOTAL (LBM)	=	546.

AIR INDUCTION SYSTEM
WEIGHT BREAKDOWN

INLET (LBM)	=	1083.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	156.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	1239.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	564.8
WAVE (LBF)	=	1446.5
TOTAL (LBF)	=	2011.3

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

CASE IDENTIFICATION NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.60330D+03	0.67589D+01	0.44741D+03	0.0	0.41129D+03	0.14000D+01	0.0	0.0
2	0.24318D+03	0.20780D+02	0.62285D+03	0.0	0.15784D+03	0.0	0.0	-0.17684D+00
3	0.24318D+03	0.48387D+02	0.83295D+03	0.0	0.93597D+02	0.0	0.0	0.0
4	0.81112D+02	0.47419D+02	0.83295D+03	0.0	0.41810D+02	0.0	0.0	0.27026D+00
5	0.13672D+03	0.47419D+02	0.83295D+03	0.0	0.53696D+02	0.35776D+00	0.43422D+02	0.0
6	0.77057D+02	0.68688D+03	0.17621D+04	0.0	0.30387D+01	0.0	0.0	0.0
7	0.40556D+01	0.56415D+03	0.16735D+04	0.0	0.0	0.0	0.0	0.0
8	0.35006D+03	0.65050D+03	0.29434D+04	0.20438D-01	0.42317D+01	0.0	0.0	-0.12663D+01
9	0.45406D+03	0.35489D+03	0.25939D+04	0.20258D-01	0.32698D+02	0.0	0.0	-0.25017D+00
10	0.45508D+03	0.17103D+03	0.22286D+04	0.20212D-01	0.81053D+02	0.38020D+00	0.15576D+03	0.0
11	0.59180D+03	0.10881D+03	0.19311D+04	0.15470D-01	0.15422D+03	0.0	0.0	0.0
12	0.60330D+03	0.10228D+03	0.30000D+04	0.35200D-01	0.20847D+03	0.10000D+01	0.56051D+02	0.0
13	0.60330D+03	0.10228D+03	0.30000D+04	0.35200D-01	0.20847D+03	0.23317D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.91897D+04	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.96532D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.17510D+05	0.56056D+04	0.0	0.70819D+00	-0.37370D+01	0.85256D+00	0.25381D+03	0.80242D+00	0.23286D+01
3	SPLITTER	0.12843D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.27358D+05	0.79712D+04	0.0	0.16045D+00	-0.66488D+02	0.94104D+00	0.49649D+02	0.93784D+00	0.14485D+02
5	DUCT B	0.31152D-02	0.50000D-01	0.30000D+00	0.21514D-01	0.66156D+02	0.56696D+04	0.81713D-01	0.99000D+00	0.30000D+04
6	TURBINE	0.51065D+05	0.79712D+04	0.10000D+01	0.25786D+01	0.67376D+00	0.49664D+04	0.96971D+00	0.89916D+00	0.18330D+01
7	TURBINE	0.69135D+05	0.56056D+04	0.10000D+01	0.23803D+01	0.55526D+00	0.45143D+04	0.65713D+00	0.89970D+00	0.20750D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10981D+01	0.10920D+01	0.84110D+03	0.49837D+03	0.76192D+03	-0.11280D+01	0.10926D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.19429D-01	0.0	0.41394D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.83408D+05	0.44481D+04	0.15133D+02	0.15977D+04	0.63890D+03	0.98000D+00	0.97278D+00	0.18248D+01	0.15133D+02
11	SHAFT	0.23708D+05	0.79712D+04	0.79712D+04	0.79712D+04	0.0	0.0	0.0	0.60462D+00	0.0
12	SHAFT	0.51625D+05	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	0.11917D+01	0.0

MACH= 1.4000 ALTITUDE= 20000. RECOVERY= 0.9653 51 ITERATIONS 204 PASSES

AIRFLOW (LB/SEC)	203.67	GROSS THRUST	83407.69	FUEL FLOW (LB/HR)	47063.14
NET THRUST	74218.04	TSFC	0.6341	NET THRUST/AIRFLOW	364.4032
TOTAL INLET DRAG	9189.65	TOTAL BRAKE SHAFT HP	75333.16	BOATTAIL DRAG	0.0
INSTALLED THRUST	74218.04	INSTALLED TSFC	0.6341	SPILLAGE + LIP DRAG	0.0

* * WARNING * * FOR COMPRESSOR (COMPONENT 2) THE R VALUE IS 0.708194

* * WARNING * * FOR COMPRESSOR (COMPONENT 4) THE R VALUE IS 0.160448

ERROR PRINT *** NO CONVERGENCE

```
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,AJMAX=0.,AJMIN=0.,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.95534D-01
SUM OF (ERRORS**2)= 0.29156D-01
SUM OF (ERRORS**2)= 0.70124D-03
SUM OF (ERRORS**2)= 0.18973D-04
SUM OF (ERRORS**2)= 0.43768D-06
SUM OF (ERRORS**2)= 0.17715D-02
SUM OF (ERRORS**2)= 0.47396D-04
SUM OF (ERRORS**2)= 0.10613D-05
SUM OF (ERRORS**2)= 0.20647D-07
FB        0
SUM OF (ERRORS**2)= 0.50913D-05
SUM OF (ERRORS**2)= 0.10576D-06
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
FB	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
30000.0 FT	2.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
626.91 LBS/FT**2	4905.20 LBS/FT**2	411.70 DEG R	741.07 DEG R	1755.34 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	9625.707
WFT (LBM/HR)	11464.727
SFC (LBM/HR/LBF)	1.191
W2 COR (LBM/SEC)	172.920
W2 ABS (LBM/SEC)	312.139
RF	0.927
CFG (PRI)	0.984
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.155
AOI/AC	0.845
AOBLD/AC	0.060
AO/AC	0.785
AOBYP/AC	0.003
AOE/AC	0.782

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.023
CD SPL (TAB 3A)	0.045
CD BLD	0.038
CD BYP	0.002
CD INL TOT	0.108
DRAG INL TOT (LBF)	1329.849
CD INL REF	0.045
DRAG INL REF (LBF)	552.931
CD INL PS	0.063
DRAG INL PS (LBF)	776.917

AFTBODY DRAG

A10/A9	2.407
A10 (FT**2)	15.877
A9 (FT**2)	6.597
P9S/PAMB	1.000
CD A/B	0.065
DRAG A/B (LBF)	1800.419
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.065
DRAG A/B TOT (LBF)	1800.419
CD A/B REF	0.049
DRAG A/B REF (LBF)	1367.036
CD A/B PS	0.016
DRAG A/B PS (LBF)	433.383

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	8415.402
WFT (LBM/HR)	11464.727
SFC (LBM/HR/LBF)	1.362
FN COR (LBF)	28407.402
WFT COR (LBM/HR)	43439.184
SFC COR (LBM/HR/LBF)	1.529

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	49.
FIREWALL (LBM) =	138.
COWL (LBM) =	360.
TOTAL (LBM) =	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	1083.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	156.
T/O DOORS (LBM) =	0.
TOTAL (LBM) =	1239.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	3210.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	665.3
WAVE (LBF) =	1905.9
TOTAL (LBF) =	2571.2

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.31543D+03	0.43727D+01	0.41184D+03	0.0	0.93477D+03	0.20000D+01	0.0	0.0
2	0.31224D+03	0.31716D+02	0.74072D+03	0.0	0.17284D+03	0.0	0.0	-0.32519D-03
3	0.31224D+03	0.57343D+02	0.89739D+03	0.0	0.10526D+03	0.0	0.0	0.0
4	0.13162D+03	0.56196D+02	0.89739D+03	0.0	0.45273D+02	0.0	0.0	-0.73904D-06
5	0.18062D+03	0.56196D+02	0.89739D+03	0.0	0.62131D+02	0.42766D+00	0.49607D+02	0.0
6	0.12504D+03	0.27082D+03	0.14382D+04	0.0	0.11298D+02	0.0	0.0	0.0
7	0.65808D+01	0.23773D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12822D+03	0.23454D+03	0.29304D+04	0.25470D-01	0.19096D+02	0.0	0.0	0.19746D-06
9	0.13316D+03	0.10144D+03	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	-0.87882D-07
10	0.13480D+03	0.53600D+02	0.21186D+04	0.24197D-01	0.74697D+02	0.34536D+00	0.49607D+02	0.0
11	0.31543D+03	0.54358D+02	0.14512D+04	0.10199D-01	0.14264D+03	0.0	0.0	0.0
12	0.31543D+03	0.51096D+02	0.14512D+04	0.10199D-01	0.15174D+03	0.10000D+01	0.27351D+02	-0.40116D-06
13	0.31543D+03	0.51096D+02	0.14512D+04	0.10199D-01	0.15174D+03	0.22104D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.19303D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.92722D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16884D+05	0.52731D+04	0.0	0.15427D+01	0.18874D+02	0.73541D+00	0.25381D+03	0.85530D+00	0.18080D+01
3	SPLITTER	0.13724D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25439D+05	0.80318D+04	0.0	0.13775D+01	0.41613D+02	0.91352D+00	0.49649D+02	0.88151D+00	0.48192D+01
5	DUCT B	0.88353D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11465D+05	0.32122D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.25439D+05	0.80318D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23122D+01
7	TURBINE	0.16884D+05	0.52731D+04	0.10000D+01	0.21460D+01	0.55526D+00	0.43867D+04	0.65713D+00	0.90053D+00	0.18925D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74648D+03	0.61463D+03	0.67097D+03	0.38082D-06	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.28929D+05	0.29508D+04	0.11685D+02	0.94998D+03	0.45627D+03	0.98000D+00	0.78390D+00	0.18682D+01	0.11685D+02
11	SHAFT	-0.51851D-02	0.80318D+04	0.80318D+04	0.80318D+04	0.0	0.0	0.0	-0.20383D-06	0.0
12	SHAFT	0.40886D-01	0.52731D+04	0.52731D+04	0.52731D+04	0.0	0.0	0.0	0.24216D-05	0.0

MACH= 2.0000   ALTITUDE= 30000.   RECOVERY= 0.9272   1 ITERATIONS   2 PASSES

AIRFLOW (LB/SEC)	312.14	GROSS THRUST	28928.94	FUEL FLOW (LB/HR)	11464.73
NET THRUST	9625.71	TSFC	1.1911	NET THRUST/AIRFLOW	30.8379
TOTAL INLET DRAG	19303.23	TOTAL BRAKE SHAFT HP	0.04	BOATTAIL DRAG	0.0
INSTALLED THRUST	9625.71	INSTALLED TSFC	1.1911	SPILLAGE + LIP DRAG	0.0

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&D
SPEC(7,10)=1,SPEC(4,9)=3000,AJMAX=689.,AJMIN=456.,
&END
NEP - INPUT
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INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
FB	ADENAB		ADENCFG	20 NOV 79

ALTITUDE	MACH NUMBER
30000.0 FT	2.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
626.91 LBS/FT**2	4905.20 LBS/FT**2	411.70 DEG R	741.07 DEG R	1755.34 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	24072.602
WFT (LBM/HR)	42554.871
SFC (LBM/HR/LBF)	1.768
W2 COR (LBM/SEC)	134.138
W2 ABS (LBM/SEC)	312.139
RF	0.927
CFG (PRI)	0.977
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.155
AOI/AC	0.845
AOBLD/AC	0.059
AO/AC	0.786
AOBYP/AC	0.179
AOE/AC	0.607

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.023
CD SPL (TAB 3A)	0.045
CD BLD	0.038
CD BYP	0.197
CD INL TOT	0.303
DRAG INL TOT (LBF)	3718.160
CD INL REF	0.045
DRAG INL REF (LBF)	552.931
CD INL PS	0.258
DRAG INL PS (LBF)	3165.228

AFTBODY DRAG

A10/A9	1.539
A10 (FT**2)	15.877
A9 (FT**2)	10.317
P9S/PAMB	1.000
CD A/B	0.031
DRAG A/B (LBF)	854.809
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.031
DRAG A/B TOT (LBF)	854.809
CD A/B REF	0.029
DRAG A/B REF (LBF)	818.995
CD A/B PS	0.001
DRAG A/B PS (LBF)	35.815

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	20871.55
WFT (LBM/HR)	42554.871
SFC (LBM/HR/LBF)	2.039
FN COR (LBF)	70454.937
WFT COR (LBM/HR)	161237.937
SFC COR (LBM/HR/LBF)	2.289

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	360.
TOTAL (LBM)	=	546.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	1083.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	156.
T/O DOORS (LBM)	=	0.
TOTAL (LBM)	=	1239.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	665.3
WAVE (LBF)	=	1905.9
TOTAL (LBF)	=	2571.2

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.32398D+03	0.43727D+01	0.41184D+03	0.0	0.93477D+03	0.20000D+01	0.0	0.0
2	0.31216D+03	0.31708D+02	0.74072D+03	0.0	0.17288D+03	0.0	0.0	-0.53945D-04
3	0.31216D+03	0.57327D+02	0.89739D+03	0.0	0.10526D+03	0.0	0.0	0.0
4	0.13158D+03	0.56181D+02	0.89739D+03	0.0	0.45273D+02	0.0	0.0	-0.73904D-06
5	0.18058D+03	0.56181D+02	0.89739D+03	0.0	0.62131D+02	0.42766D+00	0.49594D+02	0.0
6	0.12500D+03	0.27074D+03	0.14382D+04	0.0	0.11298D+02	0.0	0.0	0.0
7	0.65790D+01	0.23766D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12818D+03	0.23448D+03	0.29304D+04	0.25470D-01	0.19096D+02	0.0	0.0	0.19746D-06
9	0.13312D+03	0.10141D+03	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	-0.87882D-07
10	0.13476D+03	0.53585D+02	0.21186D+04	0.24197D-01	0.74697D+02	0.34536D+00	0.49594D+02	0.0
11	0.31534D+03	0.54343D+02	0.14512D+04	0.10199D-01	0.14264D+03	0.0	0.0	0.0
12	0.32398D+03	0.51083D+02	0.30000D+04	0.37868D-01	0.22415D+03	0.10000D+01	0.28009D+02	0.0
13	0.32398D+03	0.51083D+02	0.30000D+04	0.37868D-01	0.22415D+03	0.21914D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.19303D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.92697D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16880D+05	0.52731D+04	0.0	0.15427D+01	0.18874D+02	0.73541D+00	0.25381D+03	0.85530D+00	0.18080D+01
3	SPLITTER	0.13724D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25432D+05	0.80318D+04	0.0	0.13775D+01	0.41613D+02	0.91352D+00	0.49649D+02	0.88151D+00	0.48192D+01
5	DUCT B	0.88353D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11462D+05	0.32122D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.25432D+05	0.80318D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23122D+01
7	TURBINE	0.16880D+05	0.52731D+04	0.10000D+01	0.21460D+01	0.55526D+00	0.43867D+04	0.65713D+00	0.90053D+00	0.18925D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74648D+03	0.61463D+03	0.67097D+03	0.38082D-06	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.27390D-01	0.0	0.31093D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.43376D+05	0.43076D+04	0.11682D+02	0.14857D+04	0.68728D+03	0.98000D+00	0.97654D+00	0.18238D+01	0.11682D+02
11	SHAFT	-0.51837D-02	0.80318D+04	0.80318D+04	0.80318D+04	0.0	0.0	0.0	-0.20383D-06	0.0
12	SHAFT	0.40875D-01	0.52731D+04	0.52731D+04	0.52731D+04	0.0	0.0	0.0	0.24216D-05	0.0

MACH= 2.0000   ALTITUDE= 30000.   RECOVERY= 0.9270   0 ITERATIONS   1 PASSES

AIRFLOW (LB/SEC)	312.14	GROSS THRUST	43375.83	FUEL FLOW (LB/HR)	42554.87
NET THRUST	24072.60	TSFC	1.7678	NET THRUST/AIRFLOW	77.1215
TOTAL INLET DRAG	19303.23	TOTAL BRAKE SHAFT HP	0.04	BOATTAIL DRAG	0.0
INSTALLED THRUST	24072.60	INSTALLED TSFC	1.7678	SPILLAGE + LIP DRAG	0.0

```
&D
ENDIT=1,
&END
NEP - INPUT
```

8.2.4 DATABASE INLET 'AST', DATABASE NOZZLE 'DRP1'

```
&D
IWT=0,INST=1,IFLGRF=0,ALTP=10000,MACH=.6,ETAR=0,LABEL=F,
SPEC(7,10)=0,SPEC(4,9)=0,
&END
NEP - INPUT

MODE    1 NOW BEING USED
SUM OF (ERRORS**2)= 0.33382D+00
SUM OF (ERRORS**2)= 0.17460D+00
SUM OF (ERRORS**2)= 0.70074D-01
SUM OF (ERRORS**2)= 0.12444D-01
SUM OF (ERRORS**2)= 0.72217D-03
SUM OF (ERRORS**2)= 0.32871D-03
SUM OF (ERRORS**2)= 0.36478D-04
SUM OF (ERRORS**2)= 0.10161D-04
SUM OF (ERRORS**2)= 0.24682D-05
SUM OF (ERRORS**2)= 0.58038D-06
&I
INMAP='AST',NOZMAP='DRP1',CFGMAP='CVRP',DCDMAP=0,
DERP=0,ACI=7.,NWC=1,NWD=1,INLTWT=1,MODE=0,
INOZ(1)=10,0,0,0,KVALUE=.00025,REFMFR=0,OPTB=3.,
A10A9R=1.4,ENGNO=1.,TABRF=0.,ICFCN=2,
SCALE=1.,PRINT=1.,UNITI=1.,UNITO=1.,STOP=0.,
&END
INSTAL - INSTLL
 1
SUM OF (ERRORS**2)= 0.58038D-06
```

```
&D
SPEC(5,10)=5556,
&END
NEP - INPUT

MODE    1 NOW BEING USED
```

OLD INSTALLATION MAPS

```
************
* TABLE 1  *          LOCAL MACH NUMBER (MNO)          VS        FREE STREAM MACH NUMBER (MNFS)
************

           0.0       1.200     2.350     MNO
           0.0       1.200     2.350     MNFS


************
* TABLE 2A * INLET PRESSURE RECOVERY (PT2/PT0)       VS       MASS FLOW RATIO (AO/AC)        AND     LOCAL MACH NUMBER (MNO)
************

MNO=0.800    0.540     0.575     0.600     0.625     0.626     AO/AC
             0.960     0.970     0.973     0.940     0.700     PT2/PT0

MNO=1.200    0.550     0.575     0.600     0.615     0.625     0.630     0.631     AO/AC
             0.950     0.961     0.965     0.961     0.960     0.900     0.800     PT2/PT0

MNO=1.600    0.580     0.659     0.670     0.680     0.682     AO/AC
             0.880     0.898     0.895     0.875     0.700     PT2/PT0

MNO=1.610    0.680     0.700     0.710     AO/AC
             0.960     0.940     0.750     PT2/PT0

MNO=1.800    0.740     0.765     0.766     AO/AC
             0.960     0.950     0.800     PT2/PT0

MNO=2.000    0.805     0.820     0.825     0.826     AO/AC
             0.960     0.950     0.940     0.800     PT2/PT0

MNO=2.200    0.885     0.892     0.895     0.896     AO/AC
             0.968     0.950     0.930     0.800     PT2/PT0

MNO=2.350    0.930     0.940     0.945     0.950     AO/AC
             0.958     0.940     0.930     0.800     PT2/PT0


************
* TABLE 2B *        OPTIMUM INLET RECOVERY (PT2/PT0 OPT)       VS       LOCAL MACH NUMBER (MNO)
************
```

0.0	0.400	0.800	1.200	1.600	1.610	1.800	2.000	2.200	2.350	MNO
0.943	0.970	0.970	0.962	0.895	0.930	0.930	0.930	0.930	0.930	PT2/PTO

```
************
* TABLE 2C *
************
```

OPTIMUM MASS FLOW RATIO (AO/AC OPT) VS LOCAL MACH NUMBER (MNO)

0.600	0.800	1.200	1.600	1.610	1.800	2.000	2.200	2.350	MNO
0.615	0.610	0.615	0.665	0.702	0.760	0.825	0.895	0.945	AO/AC

```
************
* TABLE 2D *
************
```

BUZZ LIMIT MASS FLOW RATIO (AO/AC) VS LOCAL MACH NUMBER (MNO)

0.0	0.400	0.800	1.200	1.600	1.610	1.800	2.000	2.200	2.350	MNO
0.0	0.0	0.0	0.0	0.680	0.681	0.740	0.810	0.885	0.930	AO/AC

```
************
* TABLE 2E *
************
```

DISTORTION LIMIT MASS FLOW RATIO (AO/AC) VS LOCAL MACH NUMBER (MNO)

0.600	0.800	1.200	1.500	1.610	1.800	2.000	2.200	2.350	MNO
0.630	0.622	0.628	0.710	0.711	0.765	0.840	0.900	0.950	AO/AC


```
************
* TABLE 3  *
************
```

SPILLAGE DRAG COEFFICIENT (CDSPL) VS INLET MASS FLOW RATIO (AOI/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.500	0.0	0.200	0.400	0.600	0.630	2.000	AOI/AC
	0.760	0.420	0.200	0.020	0.0	0.0	CDSPL
MNO=0.850	0.0	0.200	0.400	0.600	0.630	1.000	AOI/AC
	0.860	0.500	0.240	0.055	0.0	0.0	CDSPL
MNO=1.100	0.0	0.200	0.400	0.600	0.630	1.000	AOI/AC
	1.040	0.650	0.360	0.110	0.0	0.0	CDSPL
MNO=1.260	0.0	0.200	0.400	0.600	0.630	1.000	AOI/AC
	1.110	0.700	0.360	0.112	0.0	0.0	CDSPL
MNO=1.400	0.300	0.680	1.000	AOI/AC			
	0.935	0.0	0.0	CDSPL			
MNO=1.600	0.400	0.720	1.000	AOI/AC			

1.200	0.0	0.0	CDSPL	

```
************
* TABLE 3A *
************
```

REF SPILLAGE DRAG COEFF (REF CDSPL) VS LOCAL MACH NUMBER (MNO)

0.0	0.400	0.800	1.200	1.600	1.610	1.800	2.000	2.200	2.350	MNO
0.0	0.0	0.020	0.040	0.024	0.024	0.014	0.008	0.003	0.0	REF CDSPL

```
************
* TABLE 3B *
************
```

REF INLET MASS FLOW RATIO (REF AOI/AC) VS LOCAL MACH NUMBER (MNO)

0.0	0.400	0.800	1.200	1.600	1.610	1.800	2.000	2.200	2.350	MNO
0.655	0.655	0.655	0.660	0.720	0.735	0.805	0.875	0.946	1.000	REF AOI/AC

```
************
* TABLE 4  *
************
```

BLEED DRAG COEFFICIENT (CD BLD) VS BLEED MASS FLOW RATIO (AOBLD/AC) AND LOCAL MACH NUMBER (MNO)

399

	0.0	0.600	1.000	1.600	1.610	2.200	2.350	MNO

MNO=0.0	0.0	0.040	0.080	0.120	AOBLD/AC
	0.0	0.0	0.0	0.0	CDBLD
MNO=0.600	0.0	0.040	0.080	0.120	AOBLD/AC
	0.0	0.0	0.0	0.0	CDBLD
MNO=1.000	0.0	0.040	0.080	0.120	AOBLD/AC
	0.0	0.098	0.197	0.295	CDBLD
MNO=1.600	0.0	0.040	0.080	0.120	AOBLD/AC
	0.0	0.070	0.138	0.206	CDBLD
MNO=1.610	0.0	0.040	0.080	0.120	AOBLD/AC
	0.0	0.065	0.133	0.197	CDBLD
MNO=2.200	0.0	0.040	0.080	0.120	AOBLD/AC
	0.0	0.037	0.073	0.109	CDBLD
MNO=2.350	0.0	0.040	0.080	0.120	AOBLD/AC
	0.0	0.033	0.066	0.099	CDBLD

```
************
* TABLE 5  *
************
```

BYPASS DRAG COEFFICIENT (CDBYP) VS BYPASS MASS FLOW RATIO (AOBYP/AC) AND LOCAL MACH NUMBER (MNO)

	1.200	1.400	1.700	2.100	2.350	MNO		
MNO=1.200	0.0	0.040	0.080	0.120	0.160	0.200	0.220	AOBYP/AC
	0.0	0.042	0.087	0.144	0.220	0.310	0.370	CDBYP
MNO=1.400	0.0	0.040	0.080	0.120	0.160	0.200	0.220	AOBYP/AC
	0.0	0.035	0.074	0.124	0.189	0.268	0.314	CDBYP
MNO=1.700	0.0	0.040	0.080	0.120	0.160	0.200	0.220	AOBYP/AC
	0.0	0.030	0.063	0.105	0.154	0.215	0.263	CDBYP
MNO=2.100	0.0	0.040	0.080	0.120	0.160	0.200	0.220	AOBYP/AC
	0.0	0.027	0.057	0.092	0.131	0.180	0.214	CDBYP
MNO=2.350	0.0	0.040	0.080	0.120	0.160	0.200	0.220	AOBYP/AC
	0.0	0.018	0.038	0.060	0.090	0.125	0.147	CDBYP


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************
* TABLE 6A *
************
```

BLEED MASS FLOW RATIO (AOBLD/AC) VS MASS FLOW RATIO (AO/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.600	0.300	3.000	AO/AC		
	0.0	0.0	AOBLD/AC		
MNO=0.800	0.500	0.610	1.000	AO/AC	
	0.025	0.015	0.0	AOBLD/AC	
MNO=1.000	0.500	0.610	1.000	AO/AC	
	0.044	0.024	0.0	AOBLD/AC	
MNO=1.200	0.500	0.615	1.000	AO/AC	
	0.052	0.030	0.0	AOBLD/AC	
MNO=1.600	0.500	0.610	0.700	1.000	AO/AC
	0.055	0.040	0.030	0.0	AOBLD/AC
MNO=1.610	0.600	0.700	1.000	AO/AC	
	0.050	0.036	0.0	AOBLD/AC	

MNO=1.800	0.600	0.760	1.000	AO/AC
	0.067	0.038	0.0	AOBLD/AC
MNO=2.000	0.700	0.825	1.000	AO/AC
	0.068	0.045	0.0	AOBLD/AC
MNO=2.200	0.750	0.895	1.000	AO/AC
	0.095	0.051	0.0	AOBLD/AC
MNO=2.350	0.800	0.945	1.000	AO/AC
	0.124	0.060	0.0	AOBLD/AC

****
* TABLE 6B *
****

OPTIMUM BLEED MASS FLOW RATIO (AOBLD/AC) VS LOCAL MACH NUMBER (MNO)

0.0	0.400	0.800	1.200	1.600	1.610	1.800	2.000	2.200	2.350	MNO
0.0	0.0	0.015	0.030	0.040	0.030	0.038	0.045	0.052	0.060	AOBLD/AC

****
* TABLE 7 *
****

BYPASS MASS FLOW RATIO (AOBYP/AC) VS ENGINE MASS FLOW RATIO (AOE/AC) AND LOCAL MACH NUMBER (MNO)

MNO=0.0	0.0	0.600	3.000	AOE/AC
	0.0	0.0	0.0	AOBYP/AC
MNO=1.190	0.0	6.000	3.000	AOE/AC
	0.0	0.0	0.0	AOBYP/AC
MNO=1.200	0.300	0.615	1.000	AOE/AC
	0.315	0.0	0.0	AOBYP/AC
MNO=1.400	0.300	0.635	1.000	AOE/AC
	0.335	0.0	0.0	AOBYP/AC
MNO=1.600	0.300	0.665	1.000	AOE/AC
	0.365	0.0	0.0	AOBYP/AC
MNO=1.610	0.300	0.700	1.000	AOE/AC
	0.400	0.0	0.0	AOBYP/AC

MNO=1.800	0.300	0.760	1.000	AOE/AC
	0.460	0.0	0.0	AOBYP/AC
MNO=2.00C	0.300	0.825	1.000	AOE/AC
	0.525	0.0	0.0	AOBYP/AC
MNO=2.200	0.300	0.894	1.000	AOE/AC
	0.594	0.0	0.0	AOBYP/AC
MNO=2.350	0.300	0.945	1.000	AOE/AC
	0.645	0.0	0.0	AOBYP/AC

INLET START MACH NUMBER 1.610

MINIMUM MACH NUMBER FOR INLET DRAG CALCULATIONS 0.800

****
* TABLE AB *
****

AFT-BODY DRAG COEFFICIENT (CD A/B) VS FREE STREAM MACH NUMBER (MNFS) AND AFT-BODY AREA RATIO (A10/A9)

	1.850	2.000	2.500	3.330	5.000	10.000	A10/A9			
A10/A9= 1.850	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.013	0.015	0.024	0.119	0.078	0.066	0.046	0.044	0.042	CD A/B
A10/A9= 2.000	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.014	0.017	0.026	0.130	0.088	0.075	0.052	0.052	0.050	CD A/B
A10/A9= 2.500	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.017	0.020	0.031	0.146	0.093	0.078	0.057	0.056	0.054	CD A/B
A10/A9= 3.330	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.020	0.024	0.037	0.174	0.113	0.095	0.067	0.065	0.063	CD A/B
A10/A9= 5.000	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.023	0.028	0.042	0.210	0.140	0.119	0.083	0.082	0.080	CD A/B
A10/A9=10.000	0.700	0.800	0.900	1.000	1.200	1.600	2.200	2.500	3.000	MNFS
	0.027	0.033	0.049	0.260	0.177	0.150	0.104	0.103	0.101	CD A/B

```
************
* TABLE CFG*        GROSS THRUST COEFFICIENT (CFG)      VS     NOZZLE PRESSURE RATIO (PT9/PAMB)     AND NOZZLE AREA RATIO (A9/A8)
************

              1.730     1.970     2.630     3.283     A9/A8

A9/A8   1.730 1.500     2.000     3.000     4.000     5.000     6.500     8.500     11.000    16.000    20.000    PT9/PAMB
              0.860     0.910     0.960     0.985     0.987     0.984     0.988      0.984     0.974     0.965    CFG

A9/A8   1.970 1.500     2.000     3.000     4.000     5.000     6.500     8.500     11.000    16.000    20.000    PT9/PAMB
              0.894     0.930     0.968     0.980     0.982     0.971     0.980      0.982     0.976     0.968    CFG

A9/A8   2.630 1.500     2.000     3.000     4.000     5.000     6.500     8.500     11.000    16.000    20.000    PT9/PAMB
              0.928     0.940     0.972     0.973     0.969     0.959     0.948      0.966     0.974     0.973    CFG

A9/A8   3.283 1.500     2.000     3.000     4.000     5.000     6.500     8.500     11.000    16.000    20.000    PT9/PAMB
              0.952     0.969     0.972     0.963     0.955     0.952     0.918      0.942     0.965     0.970    CFG
```

5556 CFG MAP TITLE

Z = 0.0	A9A8=	0.17300D+01							
	PTPO	0.15000D+01	0.20000D+01	0.30000D+01	0.40000D+01	0.50000D+01	0.65000D+01	0.85000D+01	0.11000D+02
	CV	0.86000D+00	0.91000D+00	0.96000D+00	0.98500D+00	0.98700D+00	0.98450D+00	0.98800D+00	0.98000D+00
	PTPO	0.16000D+02	0.20000D+02						
	CV	0.97000D+00	0.96000D+00						
Z = 0.0	A9A8=	0.19700D+01							
	PTPO	0.15000D+01	0.20000D+01	0.30000D+01	0.40000D+01	0.50000D+01	0.65000D+01	0.85000D+01	0.11000D+02
	CV	0.89400D+00	0.93000D+00	0.96800D+00	0.98000D+00	0.98200D+00	0.97100D+00	0.98000D+00	0.98000D+00
	PTPO	0.16000D+02	0.20000D+02						
	CV	0.98000D+00	0.97000D+00						
Z = 0.0	A9A8=	0.26300D+01							
	PTPO	0.15000D+01	0.20000D+01	0.30000D+01	0.40000D+01	0.50000D+01	0.65000D+01	0.85000D+01	0.11000D+02
	CV	0.92800D+00	0.94000D+00	0.97200D+00	0.97300D+00	0.96900D+00	0.95900D+00	0.94800D+00	0.97000D+00
	PTPO	0.16000D+02	0.20000D+02						
	CV	0.97000D+00	0.97000D+00						
Z = 0.0	A9A8=	0.32800D+01							
	PTPO	0.15000D+01	0.20000D+01	0.30000D+01	0.40000D+01	0.50000D+01	0.65000D+01	0.85000D+01	0.11000D+02
	CV	0.95200D+00	0.96900D+00	0.97200D+00	0.96300D+00	0.95500D+00	0.95200D+00	0.91800D+00	0.94000D+00
	PTPO	0.16000D+02	0.20000D+02						
	CV	0.96000D+00	0.97000D+00						

TABLE DATA INPUT SUMMARY 11 TABLES

TABLE NUMBER	REFERENCE NUMBER	ARRAY LOCATION
1	1001	1
2	1002	1075
3	1003	2149
4	1004	3223
5	1005	4459
6	1006	5695
7	1007	6931
8	1008	7384
9	1009	7978
10	1010	8431
11	5556	9172

DATA STORAGE ALLOCATION 20000
DATA STORAGE NOT USED   10675

```
SUM OF (ERRORS**2)= 0.58038D-06
AST       0
&WET
ITERFP(1)=1,2,3,8,9,10,0
ISECFP(1)=1,2,3,4,5,6,7,8,9,10,0,
RLFDC=3.44,ICCOMP=9,IFCOMP=10,CLMIN=3.,
&END
ETTED AREA - NACWET
&INLWT
SLST=16200.,INLET=7,QMAX=1800.,NINLET=1,KSHAPE=1.,
LDUCTS=0.,BDOOR=2.,TDOOR=1.,
&END
NLET WEIGHT - INLWT
SUM OF (ERRORS**2)= 0.97458D-03
SUM OF (ERRORS**2)= 0.27030D-06
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
AST	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
10000.0 FT	0.60

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1454.24 LBS/FT**2	1854.89 LBS/FT**2	483.03 DEG R	517.81 DEG R	366.47 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	10697.570
WFT (LBM/HR)	10092.711
SFC (LBM/HR/LBF)	0.943
W2 COR (LBM/SEC)	250.614
W2 ABS (LBM/SEC)	213.240
RF	0.970
CFG (PRI)	0.973
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.385
AOI/AC	0.615
AOBLD/AC	-.000
AO/AC	0.615
AOBYP/AC	0.0
AOE/AC	0.835

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.0
CD SPL (TAB 3A)	0.0
CD BLD	0.0
CD BYP	0.0
CD INL TOT	0.0
DRAG INL TOT (LBF)	0.0
CD INL REF	0.0
DRAG INL REF (LBF)	0.0
CD INL PS	0.0
DRAG INL PS (LBF)	0.0

AFTBODY DRAG

A10/A9	4.423
A10 (FT**2)	15.877
A9 (FT**2)	3.589
P9S/PAMB	1.000
CD A/B	0.017
DRAG A/B (LBF)	100.711
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.017
DRAG A/B TOT (LBF)	100.711
CD A/B REF	0.011
DRAG A/B REF (LBF)	64.001
CD A/B PS	0.006
DRAG A/B PS (LBF)	36.709

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	10660.85
WFT (LBM/HR)	10092.71
SFC (LBM/HR/LBF)	0.94
FN COR (LBF)	15513.74
WFT COR (LBM/HR)	15219.48
SFC COR (LBM/HR/LBF)	0.98

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	427.
TOTAL (LBM)	=	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	767.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	302.
T/O DOORS (LBM)	=	614.
TOTAL (LBM)	=	1683.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	193.1
FORM (LBF)	=	13.6
TOTAL (LBF)	=	206.7

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.21615D+03	0.10108D+02	0.48303D+03	0.0	0.29917D+03	0.60000D+00	0.0	0.0
2	0.21335D+03	0.12510D+02	0.51785D+03	0.0	0.25029D+03	0.0	0.0	-0.51990D-03
3	0.21335D+03	0.37618D+02	0.74239D+03	0.0	0.99714D+02	0.0	0.0	0.0
4	0.10673D+03	0.36866D+02	0.74239D+03	0.0	0.50899D+02	0.0	0.0	0.26906D-07
5	0.10662D+03	0.36866D+02	0.74239D+03	0.0	0.50849D+02	0.33530D+00	0.34112D+02	0.0
6	0.10139D+03	0.22135D+03	0.12941D+04	0.0	0.10633D+02	0.0	0.0	0.0
7	0.53364D+01	0.19159D+03	0.12405D+04	0.0	0.0	0.0	0.0	0.0
8	0.10419D+03	0.19035D+03	0.29249D+04	0.27651D-01	0.19103D+02	0.0	0.0	0.23863D-08
9	0.10820D+03	0.82082D+02	0.24225D+04	0.26601D-01	0.41864D+02	0.0	0.0	0.16533D-07
10	0.10953D+03	0.37840D+02	0.20522D+04	0.26268D-01	0.84614D+02	0.40016D+00	0.34112D+02	0.0
11	0.21615D+03	0.37167D+02	0.14436D+04	0.13140D-01	0.14258D+03	0.0	0.0	0.0
12	0.21615D+03	0.34937D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.10000D+01	0.18711D+02	0.37504D-07
13	0.21615D+03	0.34937D+02	0.14436D+04	0.13140D-01	0.15168D+03	0.14251D+01	0.10108D+02	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.42844D+04	0.64644D+03	0.38298D+03	0.10721D+01	0.12759D+01	0.60000D+00	0.97000D+00	0.99842D+00	0.10000D+05
2	COMPRESR	-0.16323D+05	0.60050D+04	0.0	0.15047D+01	0.54534D+01	0.10016D+01	0.25381D+03	0.84986D+00	0.30069D+01
3	SPLITTER	0.99902D+00	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.20677D+05	0.79990D+04	0.0	0.12996D+01	0.28061D+02	0.10003D+01	0.49649D+02	0.85982D+00	0.60041D+01
5	DUCT B	0.94802D-01	0.50000D-01	0.30000D+00	0.29106D-01	0.66156D+02	0.10093D+05	0.29991D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.20677D+05	0.79990D+04	0.10000D+01	0.34998D+01	0.67376D+00	0.49994D+04	0.96971D+00	0.90000D+00	0.23190D+01
7	TURBINE	0.16323D+05	0.60050D+04	0.10000D+01	0.25013D+01	0.55526D+00	0.50042D+04	0.65713D+00	0.90000D+00	0.21692D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11093D+01	0.10807D+01	0.84902D+03	0.44216D+03	0.64832D+03	-0.33224D-07	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.14982D+05	0.22300D+04	0.34562D+01	0.51686D+03	0.45627D+03	0.98000D+00	0.97320D+00	0.18672D+01	0.34562D+01
11	SHAFT	0.11804D-02	0.79990D+04	0.79990D+04	0.79990D+04	0.0	0.0	0.0	0.57085D-07	0.0
12	SHAFT	0.10711D-02	0.60050D+04	0.60050D+04	0.60050D+04	0.0	0.0	0.0	0.65618D-07	0.0

MACH= 0.6000   ALTITUDE= 10000.   RECOVERY= 0.9700   1 ITERATIONS   10 PASSES

AIRFLOW (LB/SEC)	213.24	GROSS THRUST	14982.00	FUEL FLOW (LB/HR)	10092.71
NET THRUST	10697.57	TSFC	0.9435	NET THRUST/AIRFLOW	50.1669
TOTAL INLET DRAG	4284.43	TOTAL BRAKE SHAFT HP	0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	10697.57	INSTALLED TSFC	0.9435	SPILLAGE + LIP DRAG	0.0

```
&D
INST=2,ALTP=15000,MACH=1.0,ETAR=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.19243D-01
SUM OF (ERRORS**2)= 0.43871D-04
SUM OF (ERRORS**2)= 0.12564D-05
SUM OF (ERRORS**2)= 0.96961D-03
SUM OF (ERRORS**2)= 0.62754D-05
SUM OF (ERRORS**2)= 0.53205D-07
AST       0
SUM OF (ERRORS**2)= 0.36440D-02
SUM OF (ERRORS**2)= 0.17738D-04
SUM OF (ERRORS**2)= 0.29695D-07
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
AST	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
15000.0 FT	1.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
1192.90 LBS/FT**2	2258.08 LBS/FT**2	465.20 DEG R	558.24 DEG R	835.03 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA
INCORPORATING INLET RECOVERY
AND NOZZLE CFG

FN (LBF)	9922.309
WFT (LBM/HR)	10103.441
SFC (LBM/HR/LBF)	1.018
W2 COR (LBM/SEC)	229.548
W2 ABS (LBM/SEC)	222.833
RF	0.941
CFG (PRI)	0.997
CGF (SEC)	0.0

INLET MASS
FLOW RATIOS

AOSPL/AC	0.353
AOI/AC	0.647
AOBLD/AC	0.023
AO/AC	0.624
AOBYP/AC	0.0
AOE/AC	0.625

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.0
CD SPL (TAB 3A)	0.030
CD BLD	0.057
CD BYP	0.0
CD INL TOT	0.087
DRAG INL TOT (LBF)	506.527
CD INL REF	0.030
DRAG INL REF (LBF)	175.357
CD INL PS	0.057
DRAG INL PS (LBF)	331.170

AFTBODY DRAG

A10/A9	3.925
A10 (FT**2)	15.877
A9 (FT**2)	4.045
P9S/PAMB	1.000
CD A/B	0.187
DRAG A/B (LBF)	2476.927
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.187
DRAG A/B TOT (LBF)	2476.927
CD A/B REF	0.086
DRAG A/B REF (LBF)	1140.143
CD A/B PS	0.101
DRAG A/B PS (LBF)	1336.784

INSTALLED ENGINE
PERFORMANCE DATA

FN (LBF)	8254.3
WFT (LBM/HR)	10103.4
SFC (LBM/HR/LBF)	1.2
FN COR (LBF)	14643.3
WFT COR (LBM/HR)	18926.1
SFC COR (LBM/HR/LBF)	1.2

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	427.
TOTAL (LBM)	=	613.

AIR INDUCTION SYSTEM
WEIGHT BREAKDOWN

INLET (LBM)	=	767.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	302.
T/O DOORS (LBM)	=	614.
TOTAL (LBM)	=	1683.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	399.3
FORM (LBF)	=	28.2
TOTAL (LBF)	=	427.5

CASE IDENTIFICATION NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.22560D+03	0.82972D+01	0.46522D+03	0.0	0.37378D+03	0.10000D+01	0.0	0.0
2	0.22279D+03	0.14796D+02	0.55835D+03	0.0	0.22964D+03	0.0	0.0	0.17232D-03
3	0.22279D+03	0.39553D+02	0.77032D+03	0.0	0.10088D+03	0.0	0.0	0.0
4	0.10845D+03	0.38762D+02	0.77032D+03	0.0	0.50108D+02	0.0	0.0	-0.13100D-07
5	0.11435D+03	0.38762D+02	0.77032D+03	0.0	0.52832D+02	0.35068D+00	0.35609D+02	0.0
6	0.10303D+03	0.22460D+03	0.13214D+04	0.0	0.10759D+02	0.0	0.0	0.0
7	0.54224D+01	0.19484D+03	0.12679D+04	0.0	0.0	0.0	0.0	0.0
8	0.10583D+03	0.19341D+03	0.29259D+04	0.27241D-01	0.19099D+02	0.0	0.0	-0.13689D-08
9	0.10990D+03	0.83272D+02	0.24229D+04	0.26206D-01	0.41919D+02	0.0	0.0	-0.14865D-08
10	0.11126D+03	0.39309D+02	0.20628D+04	0.25879D-01	0.82946D+02	0.39064D+00	0.35609D+02	0.0
11	0.22560D+03	0.38797D+02	0.14442D+04	0.12597D-01	0.14260D+03	0.0	0.0	0.0
12	0.22560D+03	0.36469D+02	0.14442D+04	0.12597D-01	0.15170D+03	0.10000D+01	0.19529D+02	-0.10868D-07
13	0.22560D+03	0.36469D+02	0.14442D+04	0.12597D-01	0.15170D+03	0.16208D+01	0.82972D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.73231D+04	0.10574D+04	0.62642D+03	0.12002D+01	0.18946D+01	0.10000D+01	0.94119D+00	0.10765D+01	0.15000D+05
2	COMPRESR	-0.16119D+05	0.57981D+04	0.0	0.13813D+01	0.42210D+01	0.93138D+00	0.25381D+03	0.85079D+00	0.26733D+01
3	SPLITTER	0.10544D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.21052D+05	0.80245D+04	0.0	0.13177D+01	0.31445D+02	0.98509D+00	0.49649D+02	0.86757D+00	0.57945D+01
5	DUCT B	0.93537D-01	0.50000D-01	0.30000D+00	0.28674D-01	0.66156D+02	0.10103D+05	0.30392D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.21952D+05	0.80245D+04	0.10000D+01	0.35068D+01	0.67376D+00	0.50144D+04	0.96971D+00	0.90009D+00	0.23227D+01
7	TURBINE	0.16119D+05	0.57981D+04	0.10000D+01	0.24360D+01	0.55526D+00	0.48313D+04	0.65713D+00	0.89994D+00	0.21184D+01
8	MIXER	0.40389D+03	0.27387D+03	0.11039D+01	0.10885D+01	0.83137D+03	0.47042D+03	0.64842D+03	0.15361D-07	0.10895D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.17245D+05	0.24594D+04	0.43953D+01	0.58244D+03	0.45627D+03	0.98000D+00	0.99702D+00	0.18674D+01	0.43953D+01
11	SHAFT	-0.23089D-04	0.80245D+04	0.80245D+04	0.80245D+04	0.0	0.0	0.0	-0.10968D-08	0.0
12	SHAFT	-0.21881D-03	0.57981D+04	0.57981D+04	0.57981D+04	0.0	0.0	0.0	-0.13575D-07	0.0

MACH= 1.0000 ALTITUDE= 15000. RECOVERY= 0.9412 2 ITERATIONS 3 PASSES

AIRFLOW (LB/SEC)	222.83	GROSS THRUST	17245.42	FUEL FLOW (LB/HR)	10103.44
NET THRUST	9922.31	TSFC	1.0183	NET THRUST/AIRFLOW	44.5280
TOTAL INLET DRAG	7323.11	TOTAL BRAKE SHAFT HP	-0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	9922.31	INSTALLED TSFC	1.0183	SPILLAGE + LIP DRAG	0.0

```
&D
ALTP=20000,MACH=1.4,ETAR=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.42114D-01
SUM OF (ERRORS**2)= 0.34187D-02
SUM OF (ERRORS**2)= 0.14367D-04
SUM OF (ERRORS**2)= 0.41276D-06
SUM OF (ERRORS**2)= 0.15388D-02
SUM OF (ERRORS**2)= 0.27521D-04
SUM OF (ERRORS**2)= 0.62394D-06
AST       0
SUM OF (ERRORS**2)= 0.25514D-02
SUM OF (ERRORS**2)= 0.45639D-04
SUM OF (ERRORS**2)= 0.56871D-06
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
AST	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
20000.0 FT	1.40

AMBIE PRESS	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
970.98 LBS/FT**2	3089.92 LBS/FT**2	447.37 DEG R	622.73 DEG R	1332.?8 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	9813.336
WF; (LBM/HR)	10641.008
SFC (LBM/HR/LBF)	1.084
W2 COR (LBM/SEC)	202.888
W2 ABS (LBM/SEC)	252.414
RF	0.929
CFG (PRI)	1.001
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.332
AOI/AC	0.668
AOBLD/AC	0.033
AO/AC	0.635
AOBYP/AC	0.027
AOE/AC	0.608

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.036
CD SPL (TAB 3A)	0.032
CD BLD	0.065
CD BYP	0.024
CD INL TOT	0.151
DRAG INL TOT (LBF)	1407.024
CD INL REF	0.032
DRAG INL REF (LBF)	298.410
CD INL PS	0.119
DRAG INL PS (LBF)	1108.614

AFTBODY DRAG

A10/A9	3.334
A10 (FT**2)	15.877
A9 (FT**2)	4.762
P9S/PAMB	1.000
CD A/B	0.104
DRAG A/B (LBF)	2200.928
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.104
DRAG A/B TOT (LBF)	2200.928
CD A/B REF	0.043
DRAG A/B REF (LBF)	920.051
CD A/B PS	0.061
DRAG A/B PS (LBF)	1280.877

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	7423.84
WFT (LBM/HR)	10641.00
SFC (LBM/HR/LBF)	1.43
FN COR (LBF)	16180.00
WFT COR (LBM/HR)	24972.11
SFC COR (LBM/HR/LBF)	1.54

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	49.
FIREWALL (LBM) =	138.
COWL (LBM) =	427.
TOTAL (LBM) =	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	767.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	302.
T/O DOORS (LBM) =	614.
TOTAL (LBM) =	1683.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	3210.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	569.9
WAVE (LBF) =	1266.9
TOTAL (LBF) =	1836.8

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.25518D+03	0.67589D+01	0.44741D+03	0.0	0.50973D+03	0.14000D+01	0.0	0.0
2	0.25222D+03	0.20004D+02	0.62285D+03	0.0	0.20320D+03	0.0	0.0	0.75413D-03
3	0.25222D+03	0.45287D+02	0.81430D+03	0.0	0.10255D+03	0.0	0.0	0.0
4	0.11686D+03	0.44381D+02	0.81430D+03	0.0	0.48487D+02	0.0	0.0	0.31895D-08
5	0.13536D+03	0.44381D+02	0.81430D+03	0.0	0.56160D+02	0.37720D+00	0.40244D+02	0.0
6	0.11102D+03	0.24143D+03	0.13622D+04	0.0	0.10952D+02	0.0	0.0	0.0
7	0.58432D+01	0.21028D+03	0.13091D+04	0.0	0.0	0.0	0.0	0.0
8	0.11398D+03	0.20831D+03	0.29275D+04	0.26624D-01	0.19103D+02	0.0	0.0	-0.18865D-08
9	0.11836D+03	0.89758D+02	0.24253D+04	0.25613D-01	0.41905D+02	0.0	0.0	0.14162D-08
10	0.11982D+03	0.44073D+02	0.20819D+04	0.25293D-01	0.80046D+02	0.37440D+00	0.40244D+02	0.0
11	0.25518D+03	0.43882D+02	0.14445D+04	0.11719D-01	0.14262D+03	0.0	0.0	0.0
12	0.25518D+03	0.41249D+02	0.14445D+04	0.11719D-01	0.15172D+03	0.10000D+01	0.22085D+02	-0.28572D-08
13	0.25518D+03	0.41249D+02	0.14445D+04	0.11719D-01	0.15172D+03	0.18392D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11389D+05	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.92930D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.16537D+05	0.56056D+04	0.0	0.13438D+01	0.66759D+01	0.85256D+00	0.25381D+03	0.84839D+00	0.22639D+01
3	SPLITTER	0.11583D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.22669D+05	0.80073D+04	0.0	0.13398D+01	0.36127D+02	0.95606D+00	0.49649D+02	0.87569D+00	0.54399D+01
5	DUCT B	0.91758D-01	0.50000D-01	0.30000D+00	0.28025D-01	0.66156D+02	0.10641D+05	0.31005D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.22669D+05	0.80073D+04	0.10000D+01	0.35033D+01	0.67376D+00	0.50024D+04	0.96971D+00	0.90001D+00	0.23209D+01
7	TURBINE	0.16537D+05	0.56056D+04	0.10000D+01	0.23310D+01	0.55526D+00	0.46686D+04	0.65713D+00	0.89973D+00	0.20366D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10951D+01	0.11028D+01	0.80114D+03	0.51899D+03	0.65148D+03	-0.13000D-08	0.10904D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.21202D+05	0.26733D+04	0.61030D+01	0.68575D+03	0.45627D+03	0.98000D+00	0.10005D+01	0.18578D+01	0.61030D+01
11	SHAFT	0.28056D-04	0.80073D+04	0.80073D+04	0.80073D+04	0.0	0.0	0.0	0.12[illegible]76D-08	0.0
12	SHAFT	-0.40647D-03	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	-0.24579D-07	0.0

MACH= 1.4000   ALTITUDE= 20000.   RECOVERY= 0.9293   2 ITERATIONS   3 PASSES

AIRFLOW (LB/SEC)	252.41	GROSS THRUST	21202.34	FUEL FLOW (LB/HR)	10641.01
NET THRUST	9813.34	TSFC	1.0843	NET THRUST/AIRFLOW	38.8779
TOTAL INLET DRAG	11389.00	TOTAL BRAKE SHAFT HP	-0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	9813.34	INSTALLED TSFC	1.0843	SPILLAGE + LIP DRAG	0.0

```
&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
NEP - INPUT
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
AST	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
20000.0 FT	1.40

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
970.98 LBS/FT**2	3089.92 LBS/FT**2	447.37 DEG R	622.73 DEG R	1332.18 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	20412.437
WFT (LBM/HR)	35968.980
SFC (LBM/HR/LBF)	1.762
W2 COR (LBM/SEC)	186.596
W2 ABS (LBM/SEC)	252.414
RF	0.929
CFG (PRI)	0.996
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.332
AOI/AC	0.668
AOBLD/AC	0.033
AO/AC	0.635
AOBYP/AC	0.076
AOE/AC	0.559

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.030
CD SPL (TAB 3A)	0.032
CD BLD	0.065
CD BYP	0.070
CD INL TOT	0.197
DRAG INL TOT (LBF)	1838.855
CD INL REF	0.032
DRAG INL REF (LBF)	298.410
CD INL PS	0.165
DRAG INL PS (LBF)	1540.445

AFTBODY DRAG

A10/A9	2.136
A10 (FT**2)	15.877
A9 (FT**2)	7.433
P9S/PAMB	1.000
CD A/B	0.083
DRAG A/B (LBF)	1746.787
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.083
DRAG A/B TOT (LBF)	1746.787
CD A/B REF	0.043
DRAG A/B REF (LBF)	920.051
CD A/B PS	0.039
DRAG A/B PS (LBF)	826.737

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	18045.25
WFT (LBM/HR)	35968.98
SFC (LBM/HR/LBF)	1.99
FN COR (LBF)	39329.02
WFT COR (LBM/HR)	84411.31
SFC COR (LBM/HR/LBF)	2.14

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	427.
TOTAL (LBM)	=	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	767.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	302.
T/O DOORS (LBM)	=	614.
TOTAL (LBM)	=	1683.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	569.9
WAVE (LBF)	=	1266.9
TOTAL (LBF)	=	1836.8

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.26222D+03	0.67589D+01	0.44741D+03	0.0	0.50973D+03	0.14000D+01	0.0	0.0
2	0.25222D+03	0.20004D+02	0.62285D+03	0.0	0.20320D+03	0.0	0.0	0.75413D-03
3	0.25222D+03	0.45287D+02	0.81430D+03	0.0	0.10255D+03	0.0	0.0	0.0
4	0.11686D+03	0.44381D+02	0.81430D+03	0.0	0.48487D+02	0.0	0.0	0.31895D-08
5	0.13536D+03	0.44381D+02	0.81430D+03	0.0	0.56160D+02	0.37720D+00	0.40244D+02	0.0
6	0.11102D+03	0.24143D+03	0.13622D+04	0.0	0.10952D+02	0.0	0.0	0.0
7	0.58432D+01	0.21028D+03	0.13091D+04	0.0	0.0	0.0	0.0	0.0
8	0.11398D+03	0.20831D+03	0.29275D+04	0.26624D-01	0.19103D+02	0.0	0.0	-0.18865D-08
9	0.11836D+03	0.89758D+02	0.24253D+04	0.25613D-01	0.41905D+02	0.0	0.0	0.14162D-08
10	0.11982D+03	0.44073D+02	0.20819D+04	0.25293D-01	0.80046D+02	0.37440D+00	0.40244D+02	0.0
11	0.25518D+03	0.43882D+02	0.14445D+04	0.11719D-01	0.14262D+03	0.0	0.0	0.0
12	0.26222D+03	0.41249D+02	0.30000D+04	0.39613D-01	0.22467D+03	0.10000D+01	0.22626D+02	0.0
13	0.26222D+03	0.41249D+02	0.30000D+04	0.39613D-01	0.22467D+03	0.18466D+01	0.67589D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.11389D+05	0.14517D+04	0.86005D+03	0.13921D+01	0.31849D+01	0.14000D+01	0.92930D+00	0.12009D+01	0.20000D+05
2	COMPRESR	-0.16537D+05	0.56056D+04	0.0	0.13438D+01	0.66759D+01	0.85256D+00	0.25381D+03	0.84839D+00	0.22639D+01
3	SPLITTER	0.11583D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.22669D+05	0.80073D+04	0.0	0.13398D+01	0.36127D+02	0.95606D+00	0.49649D+02	0.87569D+00	0.54399D+01
5	DUCT B	0.91758D-01	0.50000D-01	0.30000D+00	0.28025D-01	0.66156D+02	0.10641D+05	0.31005D+00	0.99000D+00	0.39000D+04
6	TURBINE	0.22669D+05	0.80073D+04	0.10000D+01	0.35033D+01	0.67376D+00	0.50024D+04	0.96971D+00	0.90001D+00	0.23209D+01
7	TURBINE	0.16537D+05	0.56056D+04	0.10000D+01	0.23310D+01	0.55526D+00	0.46686D+04	0.65713D+00	0.89973D+00	0.20366D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10951D+01	0.11028D+01	0.80114D+03	0.51899D+03	0.65148D+03	-0.13000D-08	0.10904D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.27571D-01	0.0	0.25328D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.31801D+05	0.39021D+04	0.61030D+01	0.10703D+04	0.68907D+03	0.98000D+00	0.99637D+00	0.18231D+01	0.61030D+01
11	SHAFT	0.23056D-04	0.80073D+04	0.80073D+04	0.80073D+04	0.0	0.0	0.0	0.12376D-08	0.0
12	SHAFT	-0.40647D-03	0.56056D+04	0.56056D+04	0.56056D+04	0.0	0.0	0.0	-0.24579D-07	0.0

MACH= 1.4000   ALTITUDE= 20000.   RECOVERY= 0.9293   0 ITERATIONS   1 PASSES

AIRFLOW (LB/SEC)	252.41	GROSS THRUST	31801.44	FUEL FLOW (LB/HR)	35968.98
NET THRUST	20412.44	TSFC	1.7621	NET THRUST/AIRFLOW	80.8688
TOTAL INLET DRAG	11389.00	TOTAL BRAKE SHAFT HP	-0.00	BOATTAIL DRAG	0.0
INSTALLED THRUST	20412.44	INSTALLED TSFC	1.7621	SPILLAGE + LIP DRAG	0.0

```
&D
SPEC(7,10)=0,SPEC(4,9)=0,ALTP=30000,MACH=2.,ETAR=0,
&END
NEP - INPUT

MODE     1 NOW BEING USED
SUM OF (ERRORS**2)= 0.95857D-01
SUM OF (ERRORS**2)= 0.29404D-01
SUM OF (ERRORS**2)= 0.73434D-03
SUM OF (ERRORS**2)= 0.19533D-04
SUM OF (ERRORS**2)= 0.45779D-06
SUM OF (ERRORS**2)= 0.16496D-04
SUM OF (ERRORS**2)= 0.45887D-06
AST       0
SUM OF (ERRORS**2)= 0.15767D-04
SUM OF (ERRORS**2)= 0.47654D-06
```

INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
AST	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
30000.0 FT	2.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
626.91 LBS/FT**2	4905.20 LBS/FT**2	411.70 DEG R	741.07 DEG R	1755.34 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	9511.301
WFT (LBM/HR)	11490.391
SFC (LBM/HR/LBF)	1.208
W2 COR (LBM/SEC)	173.017
W2 ABS (LBM/SEC)	312.720
RF	0.929
CFG (PRI)	0.979
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.130
AOI/AC	0.870
AOBLD/AC	0.045
AO/AC	0.825
AOBYP/AC	0.040
AOE/AC	0.785

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.0
CD SPL (TAB 3A)	0.008
CD BLD	0.052
CD BYP	0.028
CD INL TOT	0.088
DRAG INL TOT (LBF)	1082.063
CD INL REF	0.008
DRAG INL REF (LBF)	98.299
CD INL PS	0.080
DRAG INL PS (LBF)	983.763

AFTBODY DRAG

A10/A9	2.430
A10 (FT**2)	15.877
A9 (FT**2)	6.534
P9S/PAMB	1.000
CD A/B	0.063
DRAG A/B (LBF)	1766.649
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.063
DRAG A/B TOT (LBF)	1766.649
CD A/B REF	0.032
DRAG A/B REF (LBF)	882.513
CD A/B PS	0.032
DRAG A/B PS (LBF)	884.136

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	7643.39
WFT (LBM/HR)	11490.39
SFC (LBM/HR/LBF)	1.50
FN COR (LBF)	25801.39
WFT COR (LBM/HR)	43536.42
SFC COR (LBM/HR/LBF)	1.68

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE
OPTION NUMBER
3.
SCHEDULED BYPASS WITH
EXCESS INLET AIRFLOW
SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM)	=	49.
FIREWALL (LBM)	=	138.
COWL (LBM)	=	427.
TOTAL (LBM)	=	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM)	=	767.
DUCT (LBM)	=	0.
BYPASS DOORS (LBM)	=	302.
T/O DOORS (LBM)	=	614.
TOTAL (LBM)	=	1683.

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM)	=	3210.
ACCESSORIES (LBM)	=	0.
TOTAL (LBM)	=	3210.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF)	=	671.3
WAVE (LBF)	=	1669.4
TOTAL (LBF)	=	2340.7

CASE IDENTIFICATION NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.31613D+03	0.43727D+01	0.41184D+03	0.0	0.93651D+03	0.20000D+01	0.0	0.0
2	0.31294D+03	0.31787D+02	0.74072D+03	0.0	0.17277D+03	0.0	0.0	-0.68974D-03
3	0.31294D+03	0.57471D+02	0.89739D+03	0.0	0.10526D+03	0.0	0.0	0.0
4	0.13191D+03	0.56321D+02	0.89739D+03	0.0	0.45273D+02	0.0	0.0	-0.66637D-05
5	0.18103D+03	0.56321D+02	0.89739D+03	0.0	0.62131D+02	0.42766D+00	0.49718D+02	0.0
6	0.12531D+03	0.27142D+03	0.14382D+04	0.0	0.11298D+02	0.0	0.0	0.0
7	0.65955D+01	0.23826D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12851D+03	0.23507D+03	0.29304D+04	0.25470D-01	0.19096D+02	0.0	0.0	0.15844D-05
9	0.13345D+03	0.10167D+03	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	-0.11730D-05
10	0.13510D+03	0.53719D+02	0.21186D+04	0.24197D-01	0.74697D+02	0.34536D+00	0.49718D+02	0.0
11	0.31613D+03	0.54479D+02	0.14512D+04	0.10199D-01	0.14264D+03	0.0	0.0	0.0
12	0.31613D+03	0.51211D+02	0.14512D+04	0.10199D-01	0.15174D+03	0.10000D+01	0.27412D+02	-0.54893D-05
13	0.31613D+03	0.51211D+02	0.14512D+04	0.10199D-01	0.15174D+03	0.22002D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.19339D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.92930D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16922D+05	0.52730D+04	0.0	0.15427D+01	0.18874D+02	0.73541D+00	0.25381D+03	0.85529D+00	0.18080D+01
3	SPLITTER	0.13724D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25496D+05	0.80318D+04	0.0	0.13775D+01	0.41613D+02	0.91352D+00	0.49649D+02	0.88151D+00	0.48192D+01
5	DUCT B	0.88353D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11490D+05	0.32122D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.25496D+05	0.80318D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23122D+01
7	TURBINE	0.16922D+05	0.52730D+04	0.10000D+01	0.21460D+01	0.55526D+00	0.43867D+04	0.65713D+00	0.90053D+00	0.18325D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74648D+03	0.61462D+03	0.67097D+03	0.32104D-05	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.0	0.0	0.0	0.0	0.0	0.0
10	NOZZLE	0.28851D+05	0.29363D+04	0.11711D+02	0.94093D+03	0.45627D+03	0.98000D+00	0.97874D+00	0.18682D+01	0.11711D+02
11	SHAFT	-0.39763D-01	0.80318D+04	0.80318D+04	0.80318D+04	0.0	0.0	0.0	-0.15596D-05	0.0
12	SHAFT	0.45043D+00	0.52730D+04	0.52730D+04	0.52730D+04	0.0	0.0	0.0	0.26618D-04	0.0

MACH= 2.0000 ALTITUDE= 30000. RECOVERY= 0.9293 1 ITERATIONS 2 PASSES

AIRFLOW (LB/SEC)	312.72	GROSS THRUST	28850.51	FUEL FLOW (LB/HR)	11490.39
NET THRUST	9511.30	TSFC	1.2081	NET THRUST/AIRFLOW	30.4147
TOTAL INLET DRAG	19339.21	TOTAL BRAKE SHAFT HP	0.41	BOATTAIL DRAG	0.0
INSTALLED THRUST	9511.30	INSTALLED TSFC	1.2081	SPILLAGE + LIP DRAG	0.0

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&D
SPEC(7,10)=1,SPEC(4,9)=3000,
&END
NEP - INPUT
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INLET MAP	NOZZLE MAP	DEL A/B MAP	CFG MAP	DATE RUN
AST	DRP1		CVRP	20 NOV 79

ALTITUDE	MACH NUMBER
30000.0 FT	2.00

AMBIENT PRESSURE	TOTAL PRESSURE	AMBIENT TEMPERATURE	TOTAL TEMPERATURE	DYNAMIC PRESSURE
626.91 LBS/FT**2	4905.20 LBS/FT**2	411.70 DEG R	741.07 DEG R	1755.34 LBS/FT**2

INLET CAPTURE AREA (AC)	REFERENCE A10/A9 (A10/A9 R)	REFERENCE AFTBODY OR NACELLE AREA (A10R)	REFERENCE NOZZLE EXIT AREA (A9R)
7.00 FT**2	1.40	15.88 FT**2	11.34 FT**2

ENGINE PERFORMANCE DATA INCORPORATING INLET RECOVERY AND NOZZLE CFG

FN (LBF)	24188.246
WFT (LBM/HR)	42661.457
SFC (LBM/HR/LBF)	1.764
W2 COR (LBM/SEC)	96.751
W2 ABS (LBM/SEC)	312.720
RF	0.929
CFG (PRI)	0.977
CGF (SEC)	0.0

INLET MASS FLOW RATIOS

AOSPL/AC	0.130
AOI/AC	0.870
AOBLD/AC	0.045
AO/AC	0.825
AOBYP/AC	0.386
AOE/AC	0.439

INLET DRAG

AC (FT**2)	7.000
CD SPL (TAB 3)	0.0
CD SPL (TAB 3A)	0.008
CD BLD	0.052
CD BYP	0.538
CD INL TOT	0.598
DRAG INL TOT (LBF)	7346.008
CD INL REF	0.008
DRAG INL REF (LBF)	98.299
CD INL PS	0.590
DRAG INL PS (LBF)	7247.707

AFTBODY DRAG

A10/A9	1.534
A10 (FT**2)	15.877
A9 (FT**2)	10.347
P9S/PAMB	1.000
CD A/B	0.038
DRAG A/B (LBF)	1057.358
CD A/B SPR	0.0
DRAG A/B SPR (LBF)	0.0
CD A/B TOT	0.038
DRAG A/B TOT (LBF)	1057.358
CD A/B REF	0.032
DRAG A/B REF (LBF)	882.513
CD A/B PS	0.006
DRAG A/B PS (LBF)	174.844

INSTALLED ENGINE PERFORMANCE DATA

FN (LBF)	16765.69
WFT (LBM/HR)	42661.45
SFC (LBM/HR/LBF)	2.54
FN COR (LBF)	56595.01
WFT COR (LBM/HR)	161641.75
SFC COR (LBM/HR/LBF)	2.85

REFERENCE INLET MASS FLOW RATIO = 0.0

BYPASS VS SPILLAGE OPTION NUMBER
3.
SCHEDULED BYPASS WITH EXCESS INLET AIRFLOW SPILLED

NACELLE WEIGHT BREAKDOWN

ENGINE MOUNTS (LBM) =	49.
FIREWALL (LBM) =	138.
COWL (LBM) =	427.
TOTAL (LBM) =	613.

AIR INDUCTION SYSTEM WEIGHT BREAKDOWN

INLET (LBM) =	767.
DUCT (LBM) =	0.
BYPASS DOORS (LBM) =	302.
T/O DOORS (LBM) =	614.
TOTAL (LBM) =	1683.

NACELLE DRAG BUILDUP

SKIN FRICTION (LBF) =	671.3
WAVE (LBF) =	1669.4
TOTAL (LBF) =	2340.7

ENGINE WEIGHT BREAKDOWN

BARE ENGINE (LBM) =	3210.
ACCESSORIES (LBM) =	0.
TOTAL (LBM) =	3210.

CASE IDENTIFICATION   NOW GET WEIGHT AT MAX CONDITIONS, CAN'T DO IT WITH NVOPT NO

STATION PROPERTY OUTPUT DATA

FLOW STATION	WEIGHT FLOW STATP1	TOTAL PRESSURE STATP2	TOTAL TEMPERATURE STATP3	FUEL/AIR RATIO STATP4	REFERRED FLOW STATP5	MACH NUMBER STATP6	STATIC PRESSURE STATP7	INTERFACE CORRECTED FLOW ERROR STATP8
1	0.32479D+03	0.43727D+01	0.41184D+03	0.0	0.93651D+03	0.20000D+01	0.0	0.0
2	0.31294D+03	0.31787D+02	0.74072D+03	0.0	0.17277D+03	0.0	0.0	-0.68974D-03
3	0.31294D+03	0.57471D+02	0.89739D+03	0.0	0.10526D+03	0.0	0.0	0.0
4	0.13191D+03	0.56321D+02	0.89739D+03	0.0	0.45273D+02	0.0	0.0	-0.66637D-05
5	0.18103D+03	0.56321D+02	0.89739D+03	0.0	0.62131D+02	0.42766D+00	0.49718D+02	0.0
6	0.12531D+03	0.27142D+03	0.14382D+04	0.0	0.11298D+02	0.0	0.0	0.0
7	0.65955D+01	0.23826D+03	0.13857D+04	0.0	0.0	0.0	0.0	0.0
8	0.12851D+03	0.23507D+03	0.29304D+04	0.25470D-01	0.19095D+02	0.0	0.0	0.15844D-05
9	0.13345D+03	0.10167D+03	0.24308D+04	0.24503D-01	0.41761D+02	0.0	0.0	-0.11730D-05
10	0.13510D+03	0.53719D+02	0.21186D+04	0.24197D-01	0.74697D+02	0.34536D+00	0.49718D+02	0.0
11	0.31613D+03	0.54479D+02	0.14512D+04	0.10199D-01	0.14264D+03	0.0	0.0	0.0
12	0.32479D+03	0.51211D+02	0.30000D+04	0.37868D-01	0.22415D+03	0.10000D+01	0.28079D+02	0.0
13	0.32479D+03	0.51211D+02	0.30000D+04	0.37868D-01	0.22415D+03	0.21942D+01	0.43727D+01	0.0

COMPONENT OUTPUT DATA

COMPONENT NO.	TYPE	DATOUT1	DATOUT2	DATOUT3	DATOUT4	DATOUT5	DATOUT6	DATOUT7	DATOUT8	DATOUT9
1	INLET	0.19339D+05	0.19897D+04	0.11788D+04	0.17986D+01	0.78225D+01	0.20000D+01	0.92930D+00	0.14281D+01	0.30000D+05
2	COMPRESR	-0.16922D+05	0.52730D+04	0.0	0.15427D+01	0.18874D+02	0.73541D+00	0.25381D+03	0.85529D+00	0.18080D+01
3	SPLITTER	0.13724D+01	0.20000D-01	0.20000D-01	0.0	0.0	0.0	0.0	0.0	0.0
4	COMPRESR	-0.25496D+05	0.80318D+04	0.0	0.13775D+01	0.41613D+02	0.91352D+00	0.49649D+02	0.88151D+00	0.48192D+01
5	DUCT B	0.88353D-01	0.50000D-01	0.30000D+00	0.26811D-01	0.66156D+02	0.11490D+05	0.32122D+00	0.99000D+00	0.30000D+04
6	TURBINE	0.25496D+05	0.80318D+04	0.10000D+01	0.34868D+01	0.67376D+00	0.50152D+04	0.96971D+00	0.90009D+00	0.23122D+01
7	TURBINE	0.16922D+05	0.52730D+04	0.10000D+01	0.21460D+01	0.55526D+00	0.43867D+04	0.65713D+00	0.90053D+00	0.18925D+01
8	MIXER	0.40389D+03	0.27387D+03	0.10805D+01	0.11328D+01	0.74648D+03	0.61462D+03	0.67097D+03	0.32104D-05	0.10958D+01
9	DUCT B	0.0	0.60000D-01	0.30000D+00	0.27390D-01	0.0	0.31171D+05	0.0	0.98000D+00	0.30000D+04
10	NOZZLE	0.43527D+05	0.43119D+04	0.11711D+02	0.14899D+04	0.68728D+03	0.98000D+00	0.97713D+00	0.18238D+01	0.11711D+02
11	SHAFT	-0.39763D-01	0.80318D+04	0.80318D+04	0.80318D+04	0.0	0.0	0.0	-0.15596D-05	0.0
12	SHAFT	0.45043D+00	0.52730D+04	0.52730D+04	0.52730D+04	0.0	0.0	0.0	0.26618D-04	0.0

MACH= 2.0000   ALTITUDE= 30000.   RECOVERY= 0.9293   0 ITERATIONS   1 PASSES

AIRFLOW (LB/SEC)	312.72	GROSS THRUST	43527.46	FUEL FLOW (LB/HR)	42661.46
NET THRUST	24188.25	TSFC	1.7637	NET THRUST/AIRFLOW	77.3478
TOTAL INLET DRAG	19339.21	TOTAL BRAKE SHAFT HP	0.41	BOATTAIL DRAG	0.0
INSTALLED THRUST	24188.25	INSTALLED TSFC	1.7637	SPILLAGE + LIP DRAG	0.0

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&D
ENDIT=1,
&END
NEP - INPUT
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REFERENCES

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2. Onat, E., and Klees, G. W., A Method to Estimate Weight and Dimension of Large and Small Gas Turbine Engines, CR159481, NASA Lewis Research Center, January 1979.

3. Atkins, R. A., Hickcox, T. E., and Ball, W. H., Rapid Evaluation of Propulsion Effects, AFFDL-TR-78-91, Vols. I-IV, Air Force Flight Dynamics Laboratory, July 1978.

4. Fishbach, L. H., and Caddy, M. L., NNEP - The Navy NASA Engine Program NASA-TMX-71857, Lewis Research Center, December 1975.